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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3] [1914

XVII.—HINTS FOR COLLECTORS.

The following notes on the collecting of botanical specimens are issued for the convenience of collectors and travellers who may desire to send home plants in the living or dried condition, or who may be interested in collecting plants or plant products from the economic point of view.

In collecting unknown plants in the living condition in the form of seeds, tubers, &c., it is desirable that, when possible, herbarium specimens should also be collected by which the plant may be identified. In all such cases the collecting number borne by the dried specimen should also be given to the packet of seeds or the plant sent. Similarly, with native names, it is of great practical value that these should be accurately recorded, both for living and dried specimens, and where both living and dried specimens are sent the vernacular name should be given with each specimen.

I.—HORTICULTURAL DEPARTMENT.

1. **Seeds.**—When procurable, seeds should be preferred to living plants or cuttings. In a few instances, for example orchids and tuberous-rooted plants such as the tuberous aroids and many of the ginger family, *Zingiberaceae*, seeds are either of little value or too slow in giving a result; in such cases tubers or plants are preferred. On the other hand, Palms, Pandanads, Bamboos and many economic plants can be best introduced and established by means of seeds. The seeds should be ripe, and should be carefully dried before being packed. If it is not convenient to despatch the seeds at once, they should be kept dry and at a regular temperature. The facilities afforded by the post, however, make the despatch of small packages easy. Canvas bags should be used in preference to paper packets. Collectors now find it convenient to provide themselves with a stock of these in various sizes. If possible, wood tallies, with the names or numbers of the seeds, should be enclosed in the bags, as paper labels are liable to rot because of moisture from the seeds. The paper packet and wooden box were employed by Mr. E. H. Wilson when collecting seeds in China for Messrs. J. Veitch &

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Sons, and his success was remarkable. Hermetically sealed tin boxes and glass bottles should not be used, the seeds keeping fresh longest when they are so packed as to be able to part with moisture in reason. Experience has shown that all kinds of seeds, even of the commonest vegetables, may be sent successfully to the most distant tropical countries by enclosing them in ordinary paper or canvas bags, and these in a wood packing-case. It is advisable to sow the seeds as soon as possible after their arrival, although where the conditions are favourable they may be kept a month or more before sowing. Small packets may be sent by sample post: packages sent by post are almost always a success. Large quantities should be packed in a water-tight box and labelled "Seeds, perishable, to be kept cool and dry." Oily seeds, such as those of the rubber-yielding plants *Landolphia*, *Manihot*, *Hevea*, most of the *Magnoliaceae* and many of the Palms and *Leguminosae*, and those which soon lose their vitality when kept dry, such as acorns, should be packed in moist, but not wet soil, or a mixture of soil and charcoal, in wooden boxes. Such seeds may often be successfully transported in the soil of Wardian cases.

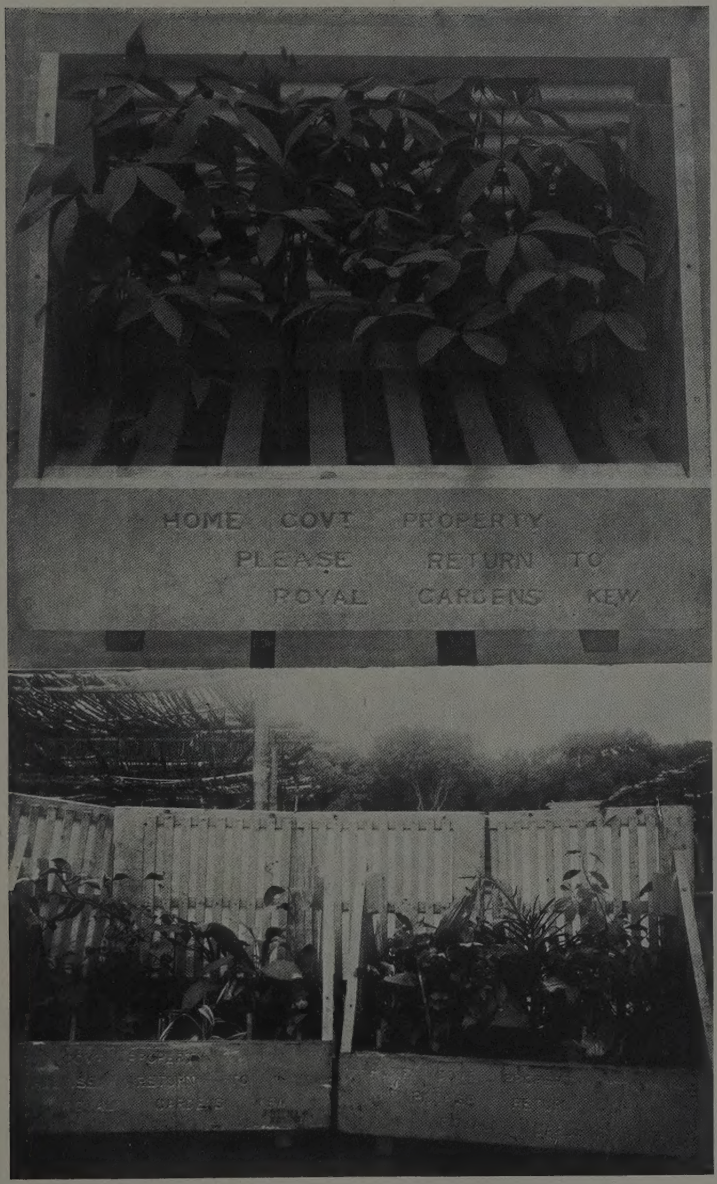
2. **Bulbs, Rhizomes and Tubers.**—These should be gathered at the end of the growing season and kept dry for a few days until the foliage has withered. They may then be packed in a wooden box in wood shavings, paper, or any dry and light material. Straw and hay, however, are apt to become mouldy and should not be used for this purpose. The rhizomes, bulbs or tubers should be packed in the box in such a manner that they cannot move about, as they are very liable to perish if bruised during transit. When the rhizomes are small or thin, they travel best if packed in slightly moistened light material, such as cocoa-nut fibre, peat soil, sawdust, or wood shavings.

Rhizomes or seeds of aquatic plants, filmy ferns, and ferns generally, other than tree ferns, travel best if packed in boxes in moist moss. In sending large ferns the fronds should be removed before despatch.

Cuttings.—Cuttings of some plants (such as *Pelargonium*) may be successfully sent for fairly long distances if tightly wrapped in oiled silk, without external moisture, and packed in tin cylinders or wood boxes.

Ripened growth of many succulent plants, such as Cacti, Euphorbias, Senecios, Stapelias, &c., may be safely collected and sent home in this way. The cuttings should be taken off where there is a constriction or articulation of the stem, and laid out in the sun for a short time to free them from extraneous moisture; they should then be tightly packed in a stout box in dry paper, or some other elastic substance, to keep them from bruising one another. Wood shavings, if thoroughly dried, are an excellent material for this purpose.

3. **Tree Ferns, Cycads, and Succulent Plants.**—Tree ferns should be dug up in the resting season with a small ball of earth sufficient to keep a few roots alive; the fronds may be cut away or



1. Wardian case ready for despatch.

2. Two cases on arrival in Uganda.

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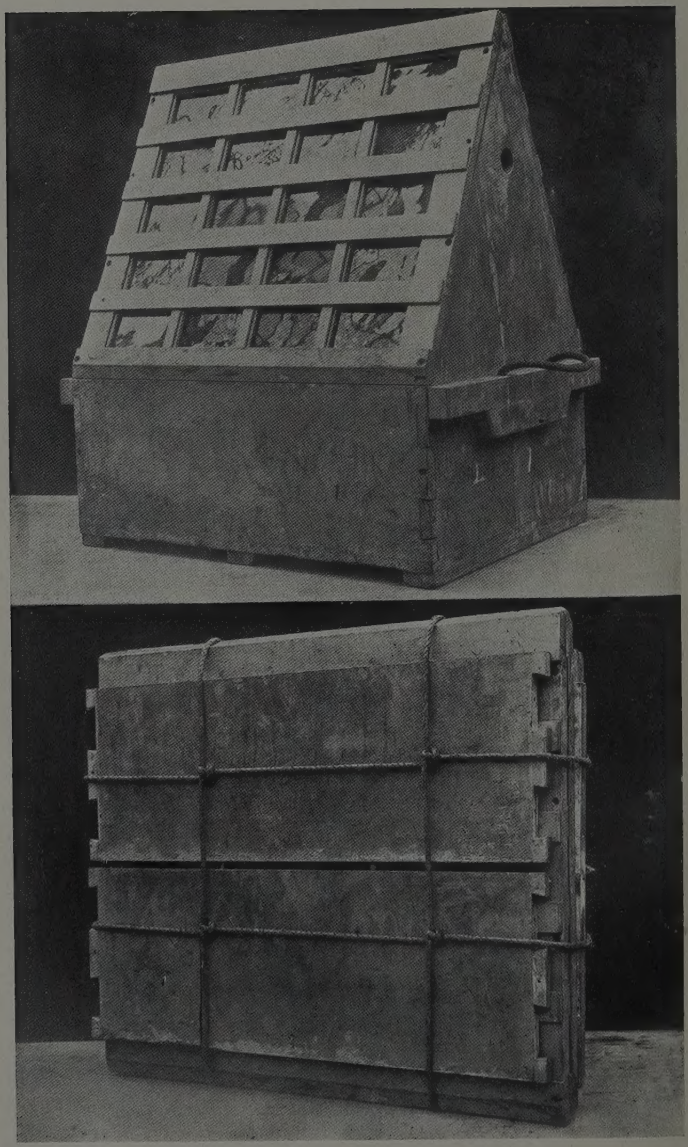

SMALL PORTABLE WARDIAN CASE.

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bent down and tied to the stems. They should then be packed in boxes in sawdust or cocoanut fibre. Cycads may be treated in the same way, except that they may be sent in boxes without packing of any kind. Succulent plants, such as Agaves, Aloes, and Cacti will travel safely if packed in a ventilated box in dry shavings, and directed to be stowed in a cool, dry place on board ship.

4. **Orchids.**—Those kinds which have fleshy pseudobulbs, such as *Dendrobium*, *Epidendrum*, *Cattleya*, *Catasetum* and *Odontoglossum*, should be collected at the end of the growing season, dried a little by exposure, and then packed in light boxes in dry wood shavings. Wide, shallow boxes are preferable to deep boxes; the latter, if used at all, should have battens placed across to support the upper layer of plants and prevent the others being crushed. A few holes should be bored into the sides of the boxes for ventilation. They may be sent by steamer and labelled "For cool, dry place in hold." *Phalaenopsis*, *Vanda*, *Cypripedium*, and all such Orchids which have no fleshy stem or pseudobulb, should be packed in close boxes or Wardian cases with damp moss or soil. If possible, they should have attention during the voyage. Tuberous Orchids may be sent as advised for tubers.

5. **Wardian Cases.**—This method is an expensive one, and should therefore only be used for plants which cannot be sent by any other means. Where convenient, the plants should be established in pots before being packed in the cases; if this cannot be done, the plants should be placed in soil in the cases several weeks, if possible, before despatch. Plants dug out of the ground and immediately sent on a long voyage have a poor chance of surviving. In packing, the soil should be rammed firmly about the pots or roots of the plants, and they should be kept in position by fastening strips of batten transversely between the rows. This is important as a guard against accident in case of overturning or rocking. The plants should be moderately moist at the roots when packed, but no water should be given immediately before the cases are screwed up. Many plants are killed by the excessive moisture inside the case which results from saturating the soil at the time of packing. Slender and weak plants should be supported by upright stakes. Each plant should have a label bearing its name or number, and this should be securely fastened to the stem or stake of the plant itself. The glass of the case should be protected by stout laths or strong wire netting. When first invented the success of the Wardian case as a means of carrying plants long distances was supposed to depend on its being kept absolutely air-tight. It is found, however, that the plants travel better when a small hole about $1\frac{1}{2}$ inches in diameter is bored in each end of the case near the top. Wardian cases should always be conspicuously labelled, "For Deck; under Awning."

The illustration shows the condition on arrival of the contents of two Wardian cases recently sent from Kew to Uganda. The cases were despatched from Kew on June 11th and reached Kampala, Uganda, on July 22nd, when the photograph was

taken. Thirty-seven plants had been packed in each case, and of these only six were dead in one case and seven in the other.

The plate facing p. 99 depicts a small portable Wardian case, constructed for use in the tropics, after its return from New Guinea packed with plants. The case is made of $\frac{3}{4}$ in. hard deal, well painted, and measures inside 23 in. long by 17 in. wide, and is 26 in. high. It is so constructed that it can be taken to pieces and packed in an easily portable parcel, and can readily be put together by means of a few screws. The weight of the case when empty is 22 lbs.

To admit light talc in small sheets has been used instead of glass, both for the sake of lightness and to obviate the danger of breakage in travelling. Talc, however, is expensive, and in its place sheets of acetate of cellulose (sold as "cellon") could be used for the roof of the case. This material is quite transparent, tough and non-inflammable.

6. **Boxes.**—Many plants with woody stems, which are capable of supporting drought for some weeks, may be packed in boxes, fixed at the ends or along the sides by means of battens so that the tops all point towards the middle of the box and are free. The roots should first be tightly enclosed in a layer of moss, wood shavings, or fibrous material, such as banana leaves, and the plants can then be arranged so that they will not move. A few small holes in the sides or lid of the box will provide ventilation. Such plants as Roses, Rhododendrons, Pelargoniums, Begonias, and Orchids have been sent successfully from Kew to distant countries, even to Australia and New Zealand.

Cases or boxes containing living plants from the East Indies Australia, &c., which are sent *via* the Suez Canal should be despatched so as to arrive in England in September, October, April, or May. The heat of the Red Sea has often proved fatal to plants passing through it during the summer (June, July, August).

Cases and boxes from America, the West Indies, &c., may be sent so as to arrive at Kew any time from the beginning of May to the end of October.

No cases containing living plants from the tropics should arrive in England in the winter months, viz., from November to April.

II.—MUSEUM DEPARTMENT.

Among the objects which should be collected for Museum purposes are:—

1. **Fruits and Seeds,** especially those which are of large size, or possess any peculiarity of form or structure entitling them to notice. Many of these are naturally dry and require little care previous to packing. Seeds that are edible, of medicinal value, or sources of oil, should, if possible, be gradually dried and packed in canvas bags. Naphthalene or carbon bisulphide should be placed with any food grains liable to attack by weevils, and such seeds should be packed in tin boxes. Those fruits and seeds, &c., that, when ripe, burst open into valves, or separate by their

scales, such, for instance, as pine-cones, should be bound round with pack-thread. Soft and fleshy fruits can only be preserved in wide-mouthed bottles, or jars, or casks (according to size) in alcohol, as rum, arrack, or in diluted pyroligneous acid or strong brine. Formalin is also a very convenient medium, a 5 per cent. solution, or 20 parts water to 1 of formalin, being generally sufficient. Fruits and fleshy plants will also travel well if soaked in spirit or formalin for a few hours and then wrapped in cotton wool saturated with either of these preservatives and packed in tin boxes. In this way Postal and Customs requirements can be complied with.

2. **Entire Plants,** or parts of them. Many have a very fleshy character and ought to be preserved entire in alcohol; or, when very large, portions of the stems and branches (according to their size) with flowers and fruit may be adequate. This method is desirable for such plants as Palms, *Stapelia*, *Rafflesia*, and others of a similar type.

3. **Trunks of Trees,** portions and sections of them, especially when they exhibit any remarkable structure: as Palms, and many other Monocotyledonous plants, and Tree Ferns. Specimens of wood should be in sections, a foot or more long, and about the average diameter of the tree. The kinds used in commerce for veneering, cabinet-work, or other useful purposes, or such as recommend themselves by their beauty, hardness, or any other valuable quality, are particularly desired. The scientific or other names, if known, should be attached, and specimens of the leaves and flowers should be sent so as to admit of their identification.

4. **Gums and Resins, Vegetable Waxes,** especially those employed in the Arts or in Domestic Economy.

5. **Dye Stuffs** of various kinds.

6. **Medicinal Substances.**—These are of much importance, and merit the attention of travellers in every country. With regard to many it is not yet known, except by the natives who collect and prepare them, what are the particular plants that afford them, and how they are prepared.

7. **General Products of Vegetables**; in the state of the raw material, and manufactured. It would be extremely difficult, not to say impossible, to enumerate all of these which a Museum ought to contain; but the enlightened traveller can form a pretty correct judgment. Such as are useful to mankind cannot fail to be interesting. It would be idle to send every well-known object of this kind, tea, sugar, coffee, cocoa, chocolate, pepper, textiles, plaiting, basket-work, clothing, &c.; but there are states even of these familiar articles which may prove both useful and instructive.

In the case of samples of timber, of various fibres, dye-stuffs,

drugs, or any other vegetable product, it is of the first importance that there should be sent along with each example a dried specimen of the leaves and flowers of the tree or plant affording the same, marked distinctly with a corresponding number, so that the source of the product may be scientifically determined. Owing to the absence of such dried specimens accompanying the timbers, drugs, fibres, &c., which have been sent to the Royal Botanic Gardens, a large number of interesting articles have been rendered absolutely valueless from the scientific point of view.

III.—HERBARIUM DEPARTMENT.

The ultimate object of collecting and preserving herbarium specimens should be the advancement of our knowledge of the existing forms of plant life and their distribution, and the deposition of the specimens as permanent records and material for comparison and re-examination.

With that object before him the intending collector will naturally consider what he should collect, and how the specimens should be selected and preserved.

His decision must depend on a variety of conditions, such as the nature of the country where the collecting is to be done and the extent to which it has already been explored, the opportunities afforded to the collector by the mode of his travel, or the circumstances of his residence.

In working out a programme the collector will have to consult the circumstances of his case with the advice of an expert, and in carrying it out he will frequently have to fall back on his own resourcefulness in modifying and adapting the hints with which he has been supplied.

A little consideration will show that even a well thought-out programme and careful selection and preservation of the specimens do not in themselves exhaust the conditions on which the value of a collection depends. The specimens will no doubt carry a great deal of information with them, but many data only known to the collector, and much observation only obtainable on the spot, must be left behind and will be lost if the collector does not provide for their immediate registration. The recording of such particulars as place and time of collecting, circumstances of association, fading colours and vanishing odours, the habits of plants which are too large to be collected entire, relations to the animal world, uses and so on, is generally referred to as "labelling," but in so far as it is frequently done in a notebook—the labels only bearing the numbers which connect the specimens with the entries—it will here be dealt with under the heading "annotation."

The following hints have therefore been grouped into the sections:—(1) The collection of specimens; (2) The selection of material; (3) Preparation and preservation; (4) Annotation; (5) The gathering of the specimens in the field; and (6) Packing. Each section has been prefaced by a general statement of the guiding principles.

I. The Collection of Specimens.

To many intending collectors the goal of ambition is probably the discovery of new species or even new genera, and in a botanically new or little-explored country such endeavours will no doubt be crowned with success. The collector will not, however, be able to distinguish between new and known forms, as even for the expert this would hardly be possible. The next impulse would probably be to collect everything and everywhere. But it is obvious that this plan, although advantageous in a new country and under favourable circumstances, will usually be impracticable. In well, or even fairly well-explored regions, such a collector would tend to be doing again work previously accomplished, and would miss much that is actually within his reach did he but know what to look for, and where to seek it. In other words, he should try to inform himself at the outset as to what is known about the flora of the country which is to form his collecting ground and what may be expected from it.

The collector working in well-explored countries must not expect discoveries of new forms, but rely on detailed observations concerning distribution and association for which his specimens will form the material to connect them finally with the correct names. Facts of distribution and association may, to a certain extent, be gleaned from any well-annotated set of specimens, but the result will be much more satisfactory if the collecting is done systematically with a view to provide material for the solution of some problem.

From these general considerations arise the following rules or hints concerning the scope and direction of collecting.

A.—If resident or making a long stay in a country.

1. In *well-explored countries* efforts should be concentrated on collecting material for the study of the distribution of plants or the composition of the more prominent types of vegetation, cultivated races, or special problems connected with plant life. Plants connected with the animal world or human economy and folk-lore may also be studied.

2. In *little-known districts of otherwise fairly well-explored countries* general and exhaustive collecting will be of value, but it is improbable that many discoveries will be made.

3. In *little-explored or unexplored countries* extensive collecting, including *all* classes of plants, will be of great importance, and will almost certainly yield new plants and important facts of distribution.

(*a*) The country should be reconnoitred in order to get a grasp of the general features of the flora, and all the prominent types of vegetation should be collected.

(*b*) Then some typical or particularly diversified area or areas should be selected and an endeavour made to exhaust the flora.

B.—If moving by easy stages and with a fair amount of available time.

4. In *well-explored countries* work as under 3 will still be

useful, but it should be more specialised and concentrated, so that the results obtained can be compared and co-ordinated.

5. In *little-known districts of otherwise well-explored countries* general collecting will still be useful, although it cannot be exhaustive. Attention should be directed mainly to the less frequent and less conspicuous plants. Otherwise work as in 3 may take its place.

6. In *little-explored or unexplored countries* collecting should, in the first place, aim at all that appears as a prominent feature in the vegetation. Any time available beyond that might be given to general or specialised collecting, according to circumstances.

C.—If travelling rapidly and with little time, or only odd intervals available.

7. Collecting in *well-explored districts* will not be of any particular value.

8. In *little-explored or unexplored countries*, collectors, even if working quite casually, may find a rich field, but some sort of method should be followed, and it will certainly enhance the value if, for instance, attention be concentrated on the most marked plants at hand, on trees and shrubs, on gregarious species, on field crops, and so on.

D.—Outposts of vegetation.

9. At *extreme altitudes or latitudes, or in small uninhabited islands and oases*, which are widely separated from land covered with vegetation, every kind of plant, phanerogamic or cryptogamic, should be collected, even though the specimens procurable may not bear organs of reproduction.

II. The Selection of Material.

It is hardly necessary to point out that a specimen, in order to be of any value as an object of study, or as a record, must be in a state which permits us either to determine it—that is, to assign it to some known species, or to exclude it positively from all the species known to us—in which case it will have to be described as new. As the classification of plants rests in the first place on the organs of reproduction, flowers and fruits, but pre-eminently the former among the higher plants, and spores and spore-carriers among the lower plants, must be collected. It is true that the vegetative organs, especially the leaves, of many plants are so specialised that they alone may enable the expert to name the plant, but the non-expert collector will never be in the position to know when this may be the case. Collecting barren specimens amounts, therefore, generally speaking, to a waste of the time of the collector as well as of the expert. Yet there are exceptions when it is justifiable, as in the case of plants of great prominence in the vegetation of more or less new countries, of very special biological or economic interest, or such as have been described above as outposts of plant life.

Although classification rests primarily on the organs of reproduction, the vegetative parts must not be neglected. They fre-

quently yield, among nearly-related species, the most tangible criteria, or afford a ready means of recognising affinities. More than that, they must be available if we are to arrive at a complete knowledge of a species. For that purpose, to speak only of the flowering plants, leaf and stem and root are organs as essential as flowers and fruits. The ideal specimen would represent the plant in its normal state, with all its parts, and the parts chosen so as to show their arrangement as well as the principal stages of development and the range of their variation. Though this ideal may not be easily attained it should be kept in mind as a guiding principle in selecting specimens.

The collector should make it a rule, to give time to selection and subsequent preservation rather than to aim at a great number of specimens, which will probably be less satisfactory and may, in the end, have to be thrown away. As long as the collector has to deal with small plants which do not exceed the dimensions of his collecting outfit, and can therefore be taken up entire, he will only have to look for healthy average individuals which bear flowers or fruits or spores, and he may add to them some in earlier stages of development. If they are not much larger, and can be doubled up, he may still do the same. But if they are too large to be folded—as many herbs, ferns, certain seaweeds, most shrubs and all trees—he will have to resort to a selection of sections to fit his paper or his bottles, and he may find it difficult to cut pieces not too large and yet representative of the plant. In those cases it will be best to choose, in the first place, a piece exhibiting the organs of reproduction in their natural connection with as much of the vegetative parts as possible, and then to supplement it, if necessary, by other sections which contain the missing parts, care being taken that the sections are made from the same individual, or if this be impossible, at least from individuals which are of the same kind. Such detached specimens must be so marked that their connection cannot be lost or doubted. But even so, some characters, such as habit, dimensions, etc., will not be shown by the specimens, however well selected, and must therefore be supplemented by notes or sketches.

The following essential points may be summarised as rules for selection.

1. Select specimens so that they shall be as *representative of the plant* as possible.

2. *Do not collect specimens without organs of reproduction*, except in very special cases, such as in those of prominent members of the vegetation of a new country, of plants of special biological or economic importance, or of plants growing at the outposts and limits of vegetable life.

3. Select specimens so that they exhibit their organs of reproduction in connection with as much of the vegetative parts as possible, and, unless unavoidable, do not detach flowers and fruits except with the object of supplementing the specimen.

4. In the case of small plants, take up whole individuals with the root, selecting the most typical of their kind.

5. In the case of larger plants, cut specimens, in the first

place, so as to satisfy rule 3, and if not sufficiently representative, supplement by material from other parts of the plant, noting carefully their connection.

III. The Preparation and Preservation of Specimens.

Specimens should be so preserved that their distinctive characters may be retained and that the minute structure of the flowers and other organs can be subsequently examined. The immediate object is to preserve them from the attacks of fungi (moulds) and insects with a minimum of injury to the general structure of the plant. Preservation may be effected by either the dry or wet methods, or by a combination of both.

A. The dry method.—Plants may be dried in various ways, but for our present purposes only methods of drying under pressure between absorbent paper and of drying in the air need be described. The former is most generally employed for "exsiccata" or herbarium specimens, as usually understood, as it has the immediate advantage of reducing the bulk of the specimens to a minimum, of preventing their curling or excessive shrinking and generally of fixing them in such a position as to exhibit all their parts in their natural connection. Drying under pressure, however, is not applicable to all specimens, either because they are woody and not compressible, too succulent, or again so delicate that they would be liable to be crushed out of recognition. Of such specimens some must be air-dried, whilst others can only be preserved in fluids. Further, it frequently happens that only certain parts are suitable for drying under pressure, and in such cases the pressed material will have to be supplemented by material dried in the air or preserved in fluids. Then, again, specimens which in the first instance had to be preserved in spirit may subsequently be dried under pressure.

Drying under pressure.

The chief points which must be considered in connection with the drying of plants under pressure between absorbent paper are (1) the kind of paper and the mode of pressure, (2) the nature of the specimens, and (3) the conditions arising out of the ultimate destination of the specimens, that is their deposition in a herbarium.

The Paper.—Drying of specimens must be effected quickly and sufficiently completely to prevent decomposition, the development of moulds and the ravages of insects. The absorbent paper must be non-sized and soft enough to apply fairly closely to the specimens, but also sufficiently strong not to disintegrate when impregnated with the moisture taken up. Nor must it be so bibulous as to draw moisture freely from the air. Many kinds of packing papers, old newspapers and most blotting papers will answer as substitutes for those which are sometimes manufactured especially for drying plants. A few drops of water sprinkled over the paper will, by the readiness with which they are absorbed, show whether or not the paper is suitable for drying

purposes. As the paper absorbs moisture it becomes less efficient, and this tendency may be counteracted by placing the specimens between layers of several sheets of paper, but it is better to change the damp papers frequently, and the oftener this is done the more quickly will the specimens become dry. Specimens under pressure, however, except those that are particularly rigid, soon become limp and their more delicate or succulent parts tend to curl up when they are transferred from the damp to a dry sheet of paper, and therefore have to be straightened and flattened out again. As this operation cannot always be successfully performed and in any case involves a waste of time, the difficulty may be overcome by placing each specimen in a folded sheet of thin paper ("retainer"), leaving it there until it is dry and changing only the intervening sheets of stouter or more absorbent paper ("pads or driers") as often as may be necessary. To facilitate the changing of the "pads," the sheets making them up should be stitched together and be of a colour different from that of the "retainers." Should fuller padding be necessary for more bulky or succulent plants two pads of "driers" may be used between each pair of "retainers." The use of easily distinguishable "retainers" or "pads" has the further advantage that the changing of the paper becomes a purely mechanical procedure which can be entrusted to unskilled hands, particularly when the free edges of the "retainers" are pinned together or folded over so that the specimens or loose parts cannot slip out. To ensure the full action of the "pads" they must, of course, be perfectly dry when taken into use, and if they are at the same time moderately warm, they will be still more effective. If well dried after each change they can be used over and over again. How to dry them must, of course, depend on circumstances. The sun may do it one day, whilst artificial heat and ventilation may have to be resorted to the next day.

Packets containing fresh specimens must not be placed immediately on others with plants already half dry. They should be either kept apart or a broad sheet of millboard should be inserted between them. Similarly, slowly drying specimens should be made up in separate packs with more ample padding.

Quite apart from the action of absorbent paper under pressure, the process of drying can be accelerated by applying heat and ventilation to increase evaporation from the packs containing the specimens; but if artificial heat be used, care must be taken that the drying is not carried so far as to make the specimens too brittle. Good results are obtained if small packs are hung up in the sun or over a fire, and if the driers are also frequently changed.

The pressure.—Pressure may be applied in various ways. It should be light at first, but be increased more or less rapidly as the specimens become dry, so as to prevent undue shrinkage or shrivelling. At the same time it must never be carried so far that the softer or more delicate parts are in danger of being crushed or of becoming glued to the paper. In fact, the collector may make it a rule that too little pressure is less harmful than

too much, since the specimens will eventually have to be examined externally and internally. If pressed too hard, the surfaces may become altered beyond recognition, hollow organs may be crushed, and overlying parts so cemented together that they can only be torn asunder. Specimens well dried under moderate pressure will be found to exhibit not only the external characters well, but also, as a rule, to resume, when soaked, their original shape, so that they can be studied in detail. Trouble, however, may be caused owing to the unequal thickness or consistency of different parts of a specimen, as for instance where thick stems are associated with thin leaves, or coarse, dry leaves with delicate flowers. In those cases, extra padding with small pieces of paper or of wadding must be introduced within the "retainer" so as to distribute the pressure more evenly or more in accord with the requirement of the several parts. These paddings are, of course, of a permanent nature, and should not be removed until the drying is completed.

The requisite pressure may be applied by weights, or better, by means of buckled straps, and it should be evenly distributed. A sufficiently strong board should be placed on the top of each pack of paper to carry the weights, or if strapping be adopted, the packs should be placed between two such boards, or preferably trellis-like gratings ("presses") made of wood or wire. When straps are used to apply pressure, gratings are more useful than solid boards, because they are lighter, and admit of evaporation, and the straps, which may be of leather or strong webbing, render the regulation of the pressure an easy matter. The gratings may be made of strong wire or of wooden staves or laths laid crosswise so as to leave openings of about 1–1½ inch square. Generally, wooden gratings will be sufficient, and they have the double advantage that they are light, and can easily be made wherever wood is at hand; but where the gratings are liable to be exposed to very rough handling, they should be of strong wire. A screw press should never be used. When moving about, the collector should have his drying apparatus as simple as possible, so that repairs and replacements of worn-out or lost parts can easily be effected.

Trellis or grating presses will answer well under almost any circumstances. They can easily be moved with their contents, suspended in the sun or over a fire, or be stood up on their narrow sides so as to expose the maximum surface to the air. On the other hand, drying under weights is only practicable when the collector is in residence, or able to stay at one place until the drying is done.

The nature of the specimens.—Most plants lend themselves more or less readily to drying under pressure between absorbent paper without any special precautions. Not a few, however, require some preparation before they can be pressed, while others are altogether unsuitable for that process, either in part or in their entirety.

All Algae, with the exception of certain calcareous, slimy or

gelatinous forms, all dry fungi, if they are not too bulky, many lichens, all mosses and liverworts, ferns and fern-allies and most flowering plants can be dried with no more preparation than a judicious adjustment of their parts, or an occasional thinning out to avoid too much overlaying. A little padding may be needed in some cases to ensure an even distribution of the pressure, or the halving of a thick stem or branch, and occasionally it may be found necessary to split a thick stem, in order to avoid having too bulky a specimen in the press. Should it be found necessary owing to the delicacy of some parts of a specimen to press them separately, and under different conditions, care must be taken to give them the same number as that belonging to the specimen from which they were taken.

Where the parts of a specimen are too large for the drying paper, even if doubled up, they must be cut up and dried separately, but as a rule it is not necessary to preserve all sections, as long as those selected allow of the reconstruction of the whole organ with the help of notes and sketches. This applies especially to large leaves and inflorescences. In the case of very large simple leaves it will usually suffice to dry enough to show the characters of the base and the tip, and a section taken from the middle from margin to margin, or from the midrib to one of the margins, noting at the same time the distances between the parts selected. Similarly in pinnate or compound leaves it will suffice to preserve enough of the petiole or rhachis of the leaf to show the mode of arrangement of the divisions, and of the latter such as will bring out the transition in shape and size from the base to the apex, or from the centre to the sides. Dimensions and numbers of parts not demonstrable in this way will, of course, have to be noted. The same applies to out-sized inflorescences.

Greater difficulties arise where the specimens or their parts are too bulky for pressing. Whenever they lend themselves to air-drying they ought to be treated in that way, and carefully numbered; and, where possible, sections should be retained in connection with the pressed specimen. Should air-drying be impracticable and the specimen not too succulent, sections must be made for pressing, the sections being chosen so as to allow of reconstruction when supplemented by notes and sketches. As there will be much shrinkage and some distortion in sections of succulent specimens, care should be taken to note the dimensions in the fresh state, or prints may be taken from the fresh sections on paper by daubing one side of the section with ink or some other staining material and pressing it firmly against a piece of paper. In this way excellent prints can be obtained of cross sections of the stems of cacti or of the leaves of agaves. Succulent plants or succulent portions of plants are frequently a cause of great trouble to the collector because they give off their moisture very reluctantly, and if subjected to great pressure, get crushed. It is best to kill such plants or succulent objects by dipping them either in boiling water or immersing them for some time in spirit, after which the specimens will readily dry in the

press; but the pressure will have to be applied very gently at first or they will be crushed. Excellent results may be obtained in this way with the most recalcitrant material, particularly if spirit be used; as the spirit can be used many times over no great supply is required.

Certain aquatic plants with limp stems and finely divided leaves, as, for instance many Ranunculi and Utricularias, or Algae with a much divided thallus, are very easily dried between absorbent paper, but they cannot be spread out properly on a dry sheet because they collapse, when taken out of the water, into shapeless tufts and bundles. They should be caught up on a sheet of stiff paper under water, when they can be spread out easily, and then by drawing the sheet slowly and slantingly out of the water with the base of the specimens towards the operator they may be fixed on the paper in their proper position and placed in the "retainer" where they will dry rapidly with a moderate application of pressure.

Herbarium conditions.—The size of the paper on which the plants are mounted varies in different herbaria, but that in use at Kew measures 16½ in. (42 cm.) by 10½ in. (26·5 cm.), which is rather smaller than that of most of the other large herbaria. For large ferns, palms, screwpines, etc., a larger paper is sometimes used, 21½ in. (54·5 cm.) by 14½ in. (36·5 cm.); but most collectors with limited means of transport will have to fit their presses to the smaller size. Quite a small-sized press can be used where collecting is confined to small plants only, as, for instance, to mosses, or to the low herbs of arctic regions or high mountains.

Stress has repeatedly been laid on the necessity for selecting representative specimens that exhibit all the parts of the plant as far as this is possible within practical limits, and of preserving them so as to allow of their subsequent external and internal examination.

For this purpose an ample quantity of flowers and fruits must be provided with the specimens, especially when these organs are small. This can generally be done quite easily, by drying an extra supply of flowers and fruits and placing them in capsules made of absorbent paper in the "retainer" along with the specimen and giving them the number of the specimen. But the collector who wishes to assist the herbarium worker to the full should cut open or divide lengthwise at least some of those flowers which he intends for the supplementary capsules, and dry them flattened out. The same applies to certain compact inflorescences, such as the "heads" of composites or the spadices of Aroids, and to many fruits and infructescences. Specimens may be almost useless unless the collector proceeds in some such way, as for instance, in the case of the Balsams, and still more, of many Iridaceous, Zingiberaceous and Marantaceous flowers, the parts of which become frequently quite inseparable and indistinguishable when they are pressed whole.

Drying in the air.

It may sometimes be necessary to dry in the air certain specimens or parts of specimens which are too bulky to be pressed

except by means of sections. This may apply to whole plants, as in the case of cushion plants, Balanophoras, or to peculiar stems, as those of cacti or cactoid Euphorbias, or to tubers, rhizomes, and bulbs, or to large fleshy flowers, or, and this is most often the case, to large fleshy fruits. It would be best to preserve such fruits by the wet method, but it is probable that, as a rule, some method of drying will have to be resorted to wherever the structure is sufficiently strong to prevent a complete collapse. In many cases mere exposure to the sun or over fire will be sufficient, but to avoid distortion and rupture the drying must not be forced. In certain cases, however, the fruits will dry so slowly that decomposition or destruction by insects in the inner parts of the specimen may occur. In these circumstances immersion in spirit previous to drying will generally accelerate the process and also destroy any fungus germs or insects that may be present. It may be found advisable to prick and also to divide any object immersed in spirit. The drying in air should not be carried so far as to make the specimens too brittle or too hard. In fact, in not a few cases it will be found that the specimens have when half-dry become sufficiently tough and reduced in bulk to be pressed without harm. This applies also to Agarics and similar fungi which cannot be laid into the press when fresh, nor preserved with advantage in fluids. They have to be slowly dried in the sun or over fire until they are tough enough to be pressed gently, and a short bath in spirit before pressing will be useful in order to destroy any grubs or insects in them.

B. The wet method.—There will always be a few objects which will defy all attempts at preservation by pressure, or by drying in air, since their soft structures will lose so much of their natural shape and consistence that they will be useless for subsequent examination. Such objects will have to be preserved in a suitable fluid, and this also applies to specimens which are intended for minute examination.

The fluids which can be used are Alcohol, Formaldehyde or Formol, and strong solutions of common Salt in water.

a. Alcohol.—Alcohol, if "proof" spirit*, should be diluted by adding 1 volume of water to each volume of spirit, as the specimens would otherwise become too brittle and would suffer in transport.

b. Formaldehyde.—This fluid has the same preserving properties as alcohol, but the objects may get too soft if left long in it. On the other hand, it has this advantage over spirit, that the same volume will go much farther. Commercial formaldehyde is a 40 per cent. solution which before use must be diluted down by the addition of water to 4 per cent. In most cases a 2 per cent. solution will be sufficiently strong. A quart of formaldehyde will therefore yield as much preservative fluid as 1 to 2 gallons of spirit. As formaldehyde in solution or in vapour is a strong

* Proof spirit is alcohol of 50 per cent. strength and ordinary whiskey is about "proof" strength. For the preservation of specimens alcohol of 20–25 per cent. strength is suitable.

irritant for all mucous membranes, care has to be taken in its use.

c. Salt.—Should other fluids fail, a concentrated solution of salt makes a fair substitute. If fairly concentrated it answers well for succulent fruits or stems and similar objects, provided care be taken that they are completely immersed in it.

Unless the collector enjoys special facilities for transport, considerations of space and weight will be very important and the receptacles will have to be selected so that they pack well. Tubes of two lengths (in the proportion of 1 : 2) and diameters from $\frac{3}{4}$ to $\frac{1}{2}$ in. and jars from 2 to 5 in. wide will generally be found to answer in most cases. The tubes should be provided with well-fitting cork stoppers, the jars with such patent lids as are used for liquid preserves. Spirit and formaldehyde may be carried in glass, earthenware or metal vessels, but salt and water can only be used in glass or earthenware receptacles.

The specimens should always be wrapped first loosely in soft paper and tied round with thread, with a label placed inside. Otherwise they will get mixed up and injured in transport. The fuller the vessel the better, as the little parcels will thus be kept in position, but it will be advisable to distribute the specimens, so that light specimens are not placed together with heavy objects. Large succulent fruits or stems need, as a rule, only be immersed for a few days in spirit or formaldehyde, and can then be packed up in sawdust, moistened with the same fluid in a well-closing box or tin, and posted home at the first opportunity.

Schweinfurth's method.—The method invented by the famous traveller and collector, Dr. G. Schweinfurth, consists of the combination of preservation in spirit or spirit vapours and subsequent drying. The plants are laid into folded sheets of paper or on single sheets of paper as if they were intended for immediate drying, the sheets being piled up without "dryers" between them, and then tied fairly tightly into bundles 2 to 3 ins. thick. The bundles are then put into a tin and saturated with spirit, after which the tin is soldered up. The vapours forming in the hermetically sealed tin are quite sufficient to preserve the specimens for a long time. When the tin finally reaches home the specimens are dried in the ordinary way. It is obvious that this process has great advantages, but on the other hand it is more expensive and adds to the difficulty of transport. During a prolonged rainy season when no fires are available for drying, or in cases where the collector has not the time to attend to the sometimes laborious process of drying, or when he travels in boats where there is no accommodation for drying his papers, and in other similar circumstances, this method may be the only possible way of preserving specimens. The tins should be about 1 in. wider and about $\frac{1}{2}$ in. longer than the paper, whilst the depth may vary from 6 to 8 in. If they are much deeper they will get too heavy, or by the time they have to be closed and soldered up there may not be enough material to fill them. The tins must be open at one end, which should be provided with flaps prepared for the soldering. These flaps should project about 1 in.

beyond the end of the tin, so that they can be turned down at right angles to the sides and thus form a support for the lid on to which it can be soldered. In order to reduce the volume of the outfit, the tins may be made in several sizes, so that they can be packed together in "nests," and the innermost tin may then be used as a receptacle for paper, the appliances for soldering, etc. The collector who intends to use such tins should remember to learn how to solder on a lid. As the paper in this process serves mainly to separate the specimens and to keep them in position, almost any kind will answer as long as it is not too thin or too soft.

The tins are filled by one bundle being placed against one side, then another against the opposite side, and the third bundle is pushed in between the two; the three bundles should so fill the tin that any shifting is impossible. The spirit or formalin is then poured over the paper until it is thoroughly saturated. A volume of liquid up to one-sixth the capacity of the tin will be found sufficient. The tins when closed must be packed in wooden cases if they have to be sent long distances, but the collector may prefer to open the cases and to dry the specimens in presses as soon as he finds himself under suitable conditions. In that case he will have to proceed very much as he would if the plants were still fresh; but he should remember that plants thus pressed dry much more quickly and more completely. Hence they require less pressure, and if dried over fire, tend to become very brittle.

IV. The Gathering of Specimens in the Field.

It is obvious that it is quite impracticable to put each specimen into the press or spirit tube immediately after it has been taken up, although this should be done in the case of exceptionally delicate objects. As a rule the specimens as they are gathered are placed in a receptacle as the collector goes along, and kept there until he arrives at his camp at the end of the day. A portfolio with a filling of sheets of paper in which the plants can be immediately laid out, or a vasculum in which the plants can remain in a fresh condition, may be used for this purpose.

The vasculum.—The vasculum is a case made of tinned sheet iron, longer than the maximum length of the specimens admissible with regard to the drying outfits, elliptic in transverse section, closed at both ends, and provided with a lid which turns on hinges. It is generally furnished with a strap to be borne over the shoulder. It is very convenient to have a partition with a separate lid at one or both ends to receive small objects, and particularly such as require special attention. The tins should be painted some light colour so as to reduce the absorption of heat. A vasculum should not be so large as to be inconvenient. The specimens must be placed in the vasculum with some care so that they do not get too much entangled or damaged in transit. Heavy objects should not be mixed up with the ordinary light herbaceous growth, nor must roots and rootstocks be laid in with more than a minimum of soil attached to them. Small and deli-

cate specimens should be protected by wrapping them up loosely in soft paper. On hot days a very moderate sprinkling of the contents with water may be helpful to keep the plants fresh.

The portfolio.—Portfolios are best made of two stout pieces of cardboard covered with some waterproof material, and slightly larger than the drying paper used, with a pair of buckled straps passing through slits and over the side which is intended to serve as back, so that the whole can be opened like a book, and the portfolio should be filled with a quantity of "retainers." It may be carried on a strap hung over the shoulder or in the hand. The specimens may be either laid in as they are collected, or a better plan is to place them at first in the vasculum, and transfer them to the portfolio from time to time during the course of the day. Such a combination of vasculum and portfolio gives the best results, and is probably the most convenient method of gathering. If the collector be accompanied by porters he may take a pair or more of light wooden presses with him filled with "retainers," and place the contents of the portfolio in a press in exchange for a fresh set of "retainers." At the end of the day's collecting it will only be necessary to interpolate the "pads" or driers in the press between the "retainers" and to tighten the straps.

Certain small and convenient improvements, such as a pocket on one of the outsides of the portfolio to hold labels, a notebook, etc., or a waterproof wrapper clipped under the straps, can easily be added according to the collector's requirements.

Tubes may be carried in strong cardboard cases or tins in the coat pockets, and the preserving fluid may be added at the end of the day. In this case, too, it will usually be advisable to wrap the objects in soft paper, adding the number before inserting them in the tubes.

V. Annotation.

It is a matter of the utmost importance that the conditions under which a specimen has been collected should be correctly and fully registered. The details required are the locality, date, altitude, local distribution, frequency, and association of the plant as well as those characters which are not always demonstrable in the dried specimen, such as colour and scent of flowers, etc. To these data may be added observations of various kinds, such as uses, vernacular names, and so on. The notes ought to be made at the time that the specimen is collected, particularly if much collecting is to be done during the day, in order to prevent the possibility of mistaken recollections. This task will be greatly facilitated if it be done methodically, and the best plan seems to be to enter all the notes in a pocket notebook with numbered pages and provided with easily detachable slips each bearing the same number in clear print. As the collector will frequently lay in duplicates, or have to divide a large specimen, or to detach certain parts, all of which ought to have the same number, it is desirable that each page should have several such slips attached to it. A specimen page of such a

collector's book, with details filled in, is shown in the illustration. The book should fit conveniently into a pocket. When particulars of a specimen have been duly noted, as many slips as may be required should be detached and fastened to the specimens. The slips may be provided with two cuts so that they can easily be slipped over the stem of a specimen. By this or some other suitable method of attachment there should be no fear of the loss of the numbers, or risk of the specimens becoming mixed, particularly if "retainers" are used. Another advantage in these printed slip numbers lies in their clearness, and in the comparative indestructibility of their numbers, whether they are exposed to the ordinary moisture of the drying press or to immersion in fluid. If the number should have to be written—and the same applies, of course, to any written label which is laid in with the specimen—no ink or ink pencil should be used, but a black, soft pencil, or a red or blue crayon.

Some collectors will find it useful to have certain items printed in their notebook such as "vernacular name," "altitude," "colour," "height," "date," etc., but too many of them tend to confuse rather than help, and it is best to print in only the more important items, such as locality, habitat, altitude and date, leaving a large space for "observations."

FARSISTAN EXPEDITION: 1910. J. F. SMITH. 250	J. F. SMITH.
Date.—*7-6-1910.* Alt. *9500'*	250
Bot. Name.—*Euphorbia.*	
Vern.—*Daracht-i-sang.*	J. F. SMITH.
Loc.—*Pir-i-zan pass.*	250
Hab.—*On rocky slopes, very common, mostly associated with Ferulas and Amygdalus.*	
In tufts up to 2' high; lower leaves crowded, glaucous; upper, like inflorescences, yellowish green, in striking contrast to the former. Involucral glands deep purple. Sheep do not touch them. Herb gathered by natives. Exact uses not ascertainable. Frequent throughout Kuh-Bil range.	J. F. SMITH. 250
	J. F. SMITH. 250

These field notes must not be confused with the labels which will eventually have to be issued and distributed with the specimens. The labels have to be written up from the field notes, and should be of a pattern similar to that shown in the figure. The heading should indicate the country where the collection was made and perhaps the title of the expedition, the scientific name of the plant (or a blank space for it), the exact locality, with a reference to the nearest large town, river or mountain, which is likely to be found in a good atlas, the altitude, the date, the name of the collector and any important observations which may be taken from the field notes. The field notes themselves should be deposited with the most complete set of specimens, and

FARSISTAN EXPEDITION: 1910.

J. F. Smith. No. 250

Bot. Name.—*Euphorbia cheiradenia, P.*

Vern.—*Darachi-i-sang.*

Loc.—*Pir-i-zan pass, between Kasrun and Shiraz, rocky slopes.*

Date—*7-6-1910.* Alt. *9500'.* Coll.—*J. F. Smith.*

if written with care they might eventually be edited and published with detachable pages, printed on one side only, when they would form a valuable addition to the distribution labels and a general source of reference.

VI. The Packing of Specimens.

The specimens when dried must be protected against dampness and the attacks of insects and other animals. They should be made up into parcels, placing a little powdered naphthaline inside, and wrapped up tightly in some waterproof material, such, for instance, as Indian waxcloth. In this way the packets may travel long distances even if no special boxes be available. Herbarium specimens which have been dried in "retainers" may be left in them; but generally these will be required again and the plants will therefore have to be transferred to other paper for packing. For this purpose ordinary newspaper or so-called "strawpaper" will be very serviceable. Should some of the specimens be bulky and likely to press on others which are more delicate and brittle, stouter pieces of paper or pieces of cardboard should be inserted in the bundle where necessary.

XVIII.—ECHIUMS FROM THE ATLANTIC ISLANDS: I.

T. A. Sprague and J. Hutchinson.

(With plate.)

The Echiums of the Atlantic Islands have long attracted attention on account of their arborescent or fruticose habit, and some have been in cultivation since 1777. They formed the subject of a valuable posthumous memoir by Auguste de Coincy, published in 1903.* Among the characters considered important by de Coincy were the nature of the annulus inside the base of the corolla, the relative height of the insertion of the stamens, and

* Bull. Herb. Boiss. ser. 2, vol. iii. pp. 261-277, 488-499.

the length of the style-arms. He draw attention to the existence of gyno-dioecism in several species (*virescens*, *giganteum* sensu lato, *hierrense* and *Decaisnei*), and described four new ones *Webbii*, *exasperatum*, *Bourgaenum* and *gentianoides*), three of which had been proposed by Webb in manuscript. Bolle* had previously described two of Webb's manuscript species (*hierrense* and *callithyrsum*), and *E. leucophaeum*, Webb, MSS., is recognised as distinct in the present paper.

Webb seems to have projected a revision of the Canarian Echiums, and it is to be regretted that this never appeared, as his knowledge of the flora of the Canaries was unrivalled. It is evident, from the names which he left in manuscript, that he would have adopted in certain cases smaller specific units than those formerly recognised by him in the Phytographia Canariensis, and that in no case would he have united species so diverse in habit and with such well-marked technical characters as *giganteum* and *aculeatum*. Christ† regarded these two as distinct species, and described *leucophaeum* as a variety of *aculeatum*, whereas Bornmüller‡ treated *leucophaeum* and *aculeatum* as varieties of *giganteum*, and de Coincy§, who knew them only in a dried state, was unable to distinguish *leucophaeum* from *giganteum* and regarded *aculeatum* as a mere form of the latter. Bornmüller considered that the differences in breadth of leaf, spininess, and indumentum were dependent on local conditions, *aculeatum* occurring, according to him, in the hottest and driest places, *leucophaeum* in somewhat moister localities, and *giganteum* usually in shady bushy places. Neither *giganteum* nor *aculeatum*, however, alters appreciably under cultivation, so that the characters mentioned are relatively fixed; and as they are associated with others derived from habit, the shape of the calyx-segments, the degree of zygomorphy of the corolla, the height of insertion of the stamens, the length of the style-arms, and the nature of the nutlets, the three species can hardly be regarded as otherwise than distinct.

The Canarian species of *Echium* and certain other genera have an extremely restricted distribution, and some which look very much alike in a dried state may be distinguished at a glance in the field, so that they require for their elucidation a knowledge of local topography and observation in the field, in addition to critical work in the herbarium.

During the course of an expedition to the Canaries in the summer of 1913 (see *K. B.*, 1913, pp. 287–299), the writers were fortunate in seeing both *E. giganteum* and *E. aculeatum* growing near Puerto Orotava, Tenerife, the former in a wild state, the latter in the garden of the Grand Hotel Taoro. On visiting the island of La Palma, two other Echiums were seen and collected which obviously represented distinct species. These are

* Ind. Sem. Hort. Berol. 1867, app. 1, pp. 6-7.
† Engl. Jahrb. vol. ix. p. 128.
‡ Engl. Jahrb. vol. xxxiii. p. 466.
§ Bull. Herb. Boiss. ser. 2, vol. iii. p. 273.

now described for the first time. One, a large bush with pink flowers, occurred in the Barranco de las Angustias on the western side of the island, and has been named *Echium Bond-Spraguei* (pl. fig. 3) in compliment to Dr. Thomas Bond Sprague, thanks to whom the writers were enabled to visit the Canaries; the other, which had white flowers and very short style-arms, was found in the Barranco del Carmen on the eastern side of the island, and has been named *E. brevirame* (pl. fig. 4).

The five species, (1) *giganteum*, (2) *leucophaeum*, (3) *Bond-Spraguei*, (4) *brevirame* and (5) *aculeatum*, constitute a very natural group. To a certain extent they form a series in the above order, the two extremes of which are represented by *giganteum*, which has the broadest and least spinulose leaves and the longest style-arms, and *aculeatum*, which has the narrowest and most spiny leaves, and (together with *brevirame*) the shortest style-arms. If the same series were traceable in the other characters and in the geographical distribution, there would be a *prima facie* case for the union of the five species. A glance at the accompanying plate and text-figure will show that these conditions are not fulfilled. The corolla is more distinctly zygomorphic in species (1) and (4) than in the others; and the broadest and shortest calyx-segments occur in (2). Secondly, the two extremes. (1) and (5), occur in the middle of the area of distribution and the intermediates to the extreme east and west. The most striking point in the distribution is that (5), though restricted in Tenerife to a small area in the north-west, occurs also in Gomera. It is the only species of the *giganteum* group which is represented in two of the islands.

The following key should be used in conjunction with the plate and the descriptions given in the enumeration, as it necessarily contains only a selection of the distinctive characters: —

Leaves narrowly oblanceolate, up to 3·5 cm. broad, almost destitute of spinules; calyx-segments broadly linear; style-arms 2–2·5 mm. long (fig. 1) ... ... 1. *E. giganteum.*

Leaves oblanceolate-linear or linear, up to 1 cm. broad, more or less spinulose :—
Style-arms 1–2 mm. long :—
Calyx-segments oblong-lanceolate (fig. 2) ... ... 2. *E. leucophaeum.*
Calyx-segments linear-lanceolate (fig. 3) ... ... 3. *E. Bond-Spraguei.*
Style-arms 0·2–0·5 mm. long :—
Lateral calyx-segments shorter than the corolla-tube (fig. 4)... ... 4. *E. brevirame.*
Lateral calyx-segments longer than the corolla-tube (fig. 5)... ... 5. *E. aculeatum.*

1. **E. giganteum,** *Linn. f.* Suppl. p. 131 (1781); Ait. Hort. Kew. vol. i. p. 187; Vent. Jard. Malm. t. 71; J. F. Jacq. Ecl. Pl. p. 93, t. 63; Lehm. Pl. Asperifol. p. 406; Webb & Berth. Phyt. Canar. sect. 3, p. 48, t. 149; Christ in Engl. Jahrb. vol. ix. p. 128; Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465; De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii. p. 271, partim (forma *genuina*).

Folia lata (usque ad 3·5 cm.), anguste oblanceolata, acuta vel obtusa, spinulis fere carentia, nervis lateralibus subtus distinctis, subtus vix sericea. *Calycis segmenta* late linearia, obtusa, medio latiora, in basin paulo angustata; segmenta lateralia corollae tubo breviores vel eum aequantia, 8–9 mm. longa, 1·4–1·6 mm. lata. *Corolla* alba, manifeste zygomorpha, lobo antico ceteris superante; lobus anticus 3–3·75 mm., laterales 2·5–3 mm., postici 2–2·5 mm. longi. *Stamina* antica 6·5–7 mm. supra basin corollae, 6–7 mm. infra apicem lobi antici inserta. *Stylus* tenuiter pilosus, pilis ascendentibus; rami 2–2·5 mm. longi, apice vix incrassati. *Nuculae* deorsum valde angustatae, satis graciles, pauci-echinulatae.

Canary Islands. Northern coast of Tenerife :—In steep places, *Masson* (coll. 1778). Near Puerto Orotava : border of a field by the road between Puerto Orotava and Santa Ursula, young fl. Nov. 26, *Lowe* 99 bis; El Durasno, fl. and fr. May 26, *Sprague & Hutchinson* 98; Barranco Martianez, fl. Jan., *Burchard* 77 (Zürich Polytechn.); on rocks at El Burgado, fl. Feb., *Bourgeau* I. 896; rocks to the east, and hill west of San Antonio, fl. Dec., *Lowe* 98 bis; sea cliffs at La Pata, fl. Dec., *Lowe* 98 bis. Icod el Alto, 600 m., fl. Jan., *Collett.* In shaded rocky places between Icod de los Viños and Garachico, 200 m., *Bornmüller* 2660 (ex Bornmüller, l.c.). Garachico, on maritime rocks, fl. Feb., *Pitard* (Zürich Polytechn.). Risco de Oro, on rocks, 120 m., *Dinn* 5.

E. giganteum may be readily recognised by its broad unarmed leaves, long style-arms and relatively slender pauci-echinulate nutlets.

2. **E. leucophaeum**, *Webb* ex Bourg. Pl. Canar. I. 466, II. 1438; De Coincy in Bull. Herb. Boiss. ser. 2, vol. iii., p. 271, in syn.; sp. nov.

Folia conferta, angusta (usque ad 1 cm. lata), linearia vel

oblanceolato-linearia, acuta, spinulis parvis debilibus margini parallelis, nervis lateralibus subtus indistinctis, subtus sericea. *Cincinni* patuli, sub fructu patentes. *Calycis segmenta* oblongo-lanceolata, subacuta, medio latiora; segmenta lateralia corollae tubo conspicue breviora, 5·5–6·5 mm. longa, 1·5–2 mm. lata. *Corollae* lobus anticus 2·5–3 mm., laterales 2·2–3 mm., postici 2·5 mm. longi. *Stamina antica* 6–7 mm. supra basin corollae, 5·5 mm. infra apicem lobi antici inserta. *Stylus* tenuiter pilosus pilis suberectis, parte media incrassata applanataque; rami 1–2 mm. longi. *Nuculae* crassae, modice echinulatae.—*E. aculeatum*, var. *leucophaeum*, Christ in Engl. Jahrb. vol. ix. p. 128; Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465 (plantis palmensibus exclusis). *E. giganteum*, var. *leucophaeum*, Bornmüller, l.c. 466.

Canary Islands. North-eastern Tenerife: north middle region of the Anaga Mountains, on steep rocks, fl. March 20, *Perraudière;* in dry rocky places of the lower region, fl. March *Bourgeau* I. 53; Anaga Mountains, Barranco de Igueste and Barranco de Draguillo, fl. April, *Schröter;* in rocky places near Bajamar, fl. May, *Bourgeau* I. 466; in rocky places in the barrancos of Bajamar and Bufadero, fl. March, *Bourgeau* II. 1438; La Goleta, fr. June, *Murray*.

E. leucophaeum differs from *E. giganteum* in the shorter, broader calyx-segments, shorter style-arms, stouter, more echinulate nutlets and in the lateral cymes, which are spreading in fruit.

3. **E. Bond-Spraguei**, sp. nov.

Folia oblanceolato-linearia vel linearia (vix usque ad 1 cm. lata), acuta vel subacuta, spinulis marginalibus et costalibus numerosis manifestis ascendentibus, nervis lateralibus plus minusve distinctis, subtus sericea. *Calycis segmenta* linearilanceolata, subacuta, basi et medio aequilata, a medio ad apicem angustata; segmenta lateralia corollae tubo breviora, 6–6·5 mm. longa, 1·2–1·5 mm. lata. *Corolla* rosea, in toto 12–13 mm. longa; lobus anticus 2·5–3 mm., laterales 2·5 mm., postici 2·5–3 mm. longi. *Stamina* antica 6·5–7 mm. supra basin corollae, 5·5–6 mm. infra apicem lobi antici inserta. Stylus inferne patule pilosus; rami 1–1·2 mm. longi. *Nuculae* (immaturae tantum visae modice echinulatae, cornu valde alato.—*E. aculeatum*, forma inermis, Webb, MSS.

Canary Islands. Palma: western region; Barranco de las Angustias, near Cruz de la Viña, fl. June 11, *Sprague & Hutchinson* 335; on dry rocks, *Webb;* Los Llanos, fl. June 13, *R. P. Murray*.

Murray's specimen is functionally female, as stated by De Coincy (Bull. Herb. Boiss. ser. 2, vol. iii. p. 274). The corolla is 7–8 mm. long, with distinct pockets outside, opposite the insertion of the three posticous stamens. The stamens are very slightly exserted. The anticous ones are inserted 3–3·5 mm. above the base of the corolla-tube, 4–4·5 mm. below the apex of the anticous lobe. The calyx and style-arms resemble those of the hermaphrodite plant. Several of the Canarian species of

Echium are known to be gyno-dioecious. The female plants are comparatively rare. The corollas are smaller than those of hermaphrodite plants, the stamens are included or very shortly exserted, and the anthers oblong-linear, sterile.

E. Bond-Spraguei is allied to *E. leucophaeum* and *E. brevirame*. It differs from the former in its more spinulose leaves, narrower calyx-segments, (usually) shorter style-arms, and in the lateral cymes which are not spreading in fruit; it may be distinguished from the latter by its less zygomorphic corolla, differently shaped calyx-segments, stamens inserted near the middle of the corolla, and longer style-arms.

4. **E. brevirame,** sp. nov.

Folia oblanceolato-linearia vel linearia (usque ad 1 cm. lata), acuta vel subacuta, spinulis marginalibus satis numerosis manifestis ascendentibus, costalibus paucis sparsis, nervis lateralibus plus minusve distinctis, subtus sericea. *Calycis segmenta* lanceolato-linearia, subacuta, a basi ad apicem angustata; segmenta lateralia corollae tubo breviora, 5·5–8 mm. longa, medio 0·8–1·2 mm. lata. *Corolla* alba, manifeste zygomorpha, in toto 12–13 mm. longa; lobus anticus 2·5 mm., laterales 2–2·5 mm., postici 2–2·5 mm. longi. *Stamina* antica 7·5–8·5 mm. supra basin corollae, 4–4·5 mm. infra apicem lobi antici inserta. *Stylus* grosse pilosus, pilis inferne patentibus; rami 0·2–0·4 mm. longi. *Nuculae* crassae, valde echinulatae.—*E. aculeatum* var. *leucophaeum*, Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465, quoad stirpem palmensem.

Canary Islands. Palma: eastern region; northern face of Barranco Carmen, fl. May 31, *Sprague & Hutchinson* 162; Barranco del Rio, fl. June 9, *R. P. Murray*.

The leaves of the two small specimens gathered by Murray are rather more crowded than in typical *E. brevirame*, and the anticous stamens are inserted a little nearer the middle of the corolla. The specific name refers to the very short style-arms, which serve, with other characters, to distinguish this species from *E. Bond-Spraguei*. *E. brevirame* differs from *E. aculeatum* in the less spinulose leaves, the shorter calyx-segments, and the inflorescence.

5. **E. aculeatum,** *Poir.* Encycl. Méth. vol. viii. p. 664; Lehm. Pl. Asperifol. p. 405, t. 5 (ic. mala); Webb & Berth. Phytogr. Canar. sect. 3, p. 50, excl. var.

Folia anguste linearia (usque ad 5 mm. vel rare fere 1 cm. lata), acuta vel subacuta, margine et costa subtus spinosissima, spinis patulis, subtus sericea, nervis lateralibus plerumque indistinctis. *Calycis segmenta* lineari-subulata, acuta, a basi ad apicem angustata; segmenta lateralia corollae tubo longiora, 10–11 mm. longa, 0·8 mm. lata, conspicue spinosa. *Corolla* alba; lobus anticus 2·5–3 mm., laterales 2–2·5 mm., postici 3 mm. longi. *Stamina* antica 7 mm. supra basin corollae, 5·5 mm. infra apicem lobi antici inserta. *Stylus* supra medium incrassatus, pilis ascendentibus; rami 0·2–0·5 mm. longi.—*E. aculeatum*, var. *genuinum*, Bornmüller in Engl. Jahrb. vol. xxxiii. p. 465. *E. giganteum*, var. *aculeatum*, Bornmüller, l.c. 466.

Canary Islands. North-western Tenerife: Montaña de Taco, near Buenavista, *Webb;* at 200 m., fl. June, *Burchard* 260 (Zürich Polytechn.); Buenavista, on sunny rocks, fl. March, *Bourgeau* II. 1431. Gomera: San Sebastian, 300 m., fl. March, *Kuntze;* in dry places, *Pitard* 622 (Zürich Polytechn.); Hermigua, fl. April, *Lowe* 34.

The lateral cymes of *E. aculeatum* are much contracted, and leafy below, and form a leafy corymbose thyrse in which the flowers are half hidden by the calyx-segments and bracts. The cymes are shorter, fewer-flowered and denser than in the other species.

Explanation of Plate.

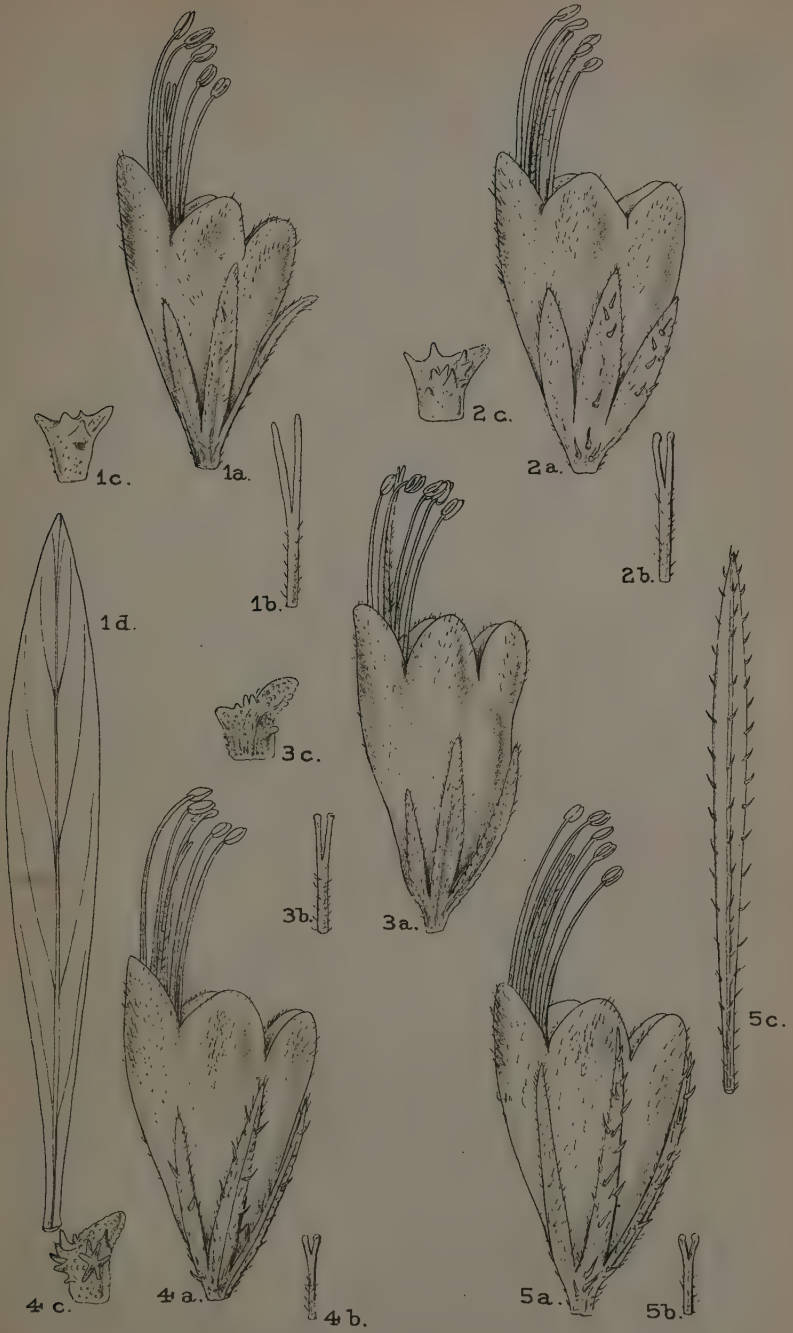
Fig. 1a, flower of *Echium giganteum.*
1b, style-arms.
1c, nutlet.
1d, leaf.
Fig. 2a, flower of *E. leucophaeum.*
2b, style-arms.
2c, nutlet.
Fig. 3a, flower of *E. Bond-Spragueï.*
3b, style-arms.
3c, nutlet (immature).
Fig. 4a, flower of *E. brevirame.*
4b, style-arms.
4c, nutlet.
Fig. 5a, flower of *E. aculeatum.*
5b, style-arms.
5c, leaf.
Flowers, × 3½; style-arms, × 6; nutlets, × 5; leaves, natural size (1d, a small one).

XIX.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta VI.

Clematis Kerriana, *Drummond et Craib* [Ranunculaceae—Clematideae]; e grege *C. Vitalbae,* Linn., maxime *C. gourianae,* Roxb., affinis a qua propter foliola breviora basi vix cordata subcoriacea nec chartacea constanter pubescentia nunquam glabrata et antheras duplo longiores loculis omnino parallelis nec basi divaricatis bene distinguitur.

Herba sarmentosa, late scandens, ramis sublignosis angulatis alte inaequaliter sulcatis purpurascentibus pilis ad 0·5 mm. (statu exsiccato) longis cinereo-fulvescentibus crebre vestitis. *Folia* bipinnata vel (inferiora) pinnata, superiora longitudine 15–20 cm. attingentia, pinnis inter se 5–6 cm. distantibus, rhachi ramulis omnino simili plus minusve flexuosa; foliola subcoriacea, terna, terminale quam lateralia semper manifeste majus, circiter 1·8–5 cm. longum et 1·5 cm. latum, ovato-lanceolatum, basi plus minusve oblique rotundatum, rarissime obscure subcordatum, mox in apicem fere cuspidatum sensim attenuatum, lateralia acuta, vix acuminata, omnia subtrinervia, pagina superiore sordide viridia, plus minusve evidenter bullata, pilis albidis subadpressis laxiuscule conspersa, venis primariis manifeste impressis ceteris inconspicuis, pagina inferiore



Canary Echiums.

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pallescentia, venis argute eminentibus satis intra marginem arcuatim inosculantibus, pilis modicis adscendentibus argenteo-canescentibus ad costas longioribus et tunc subbifarie patentibus induta, margine anguste revoluto integerrimo rarius et obtuse lobata, pilis (oculo armato) quasi ciliata. *Inflorescentia* dichotoma, pubescens; pedunculus universalis paulo post anthesin 4·5–7·5 cm. longus, partiales huc illuc bracteis foliosis conspicuis subspatulatis saepius vix 4 mm. longis crassiusculis suffulti; pedicelli circiter 15 mm. longi, tenues, subrigidi, similiter bracteolati, acute divaricati; alabastra sub anthesin pyriformia, obtusa, circiter 6 mm. longa et 4 mm. diametro; flores albidi, odori (ex *Kerr*). *Sepala* expansa denique patentia, oblongo-spatulata, apice obtuse acuminata, externe adpresse tomentosa, intus intricate villosa, albida. *Antherae* muticae, 2·5 mm. vel paulo magis longae, loculis basi omnino parallelis nec divaricatis, cum connectivo lineari et filamentis circiter 4 mm. vel plus longis medio obscure nec basin versus dilatatis, glaberrimae. *Achaenia* (immatura) lateraliter compressa, ambitu dimidiato-fusiformia, nitide castanea, villis argenteis conspicuis fere erectis tecta; styli ad 4 cm. producti, eleganter albide plumosi.

Mê Ka Mi, on bushes and trees by stream, 300 m., *Kerr* 2374.

This may be *C. Vitalba*, Linn., var. *microcarpa*, Franchet Pl. Delavay, based on *Delavay* No. 2984 in hedges at Tapintze, Yunnan. The following are also very closely allied:— Tachienlu, *Pratt* 272, Mengtze, *Hancock* 252, Red River, *Henry* 10919, 10919A, S. W. China, *Monbeig* and Upper Burma, Shan States, *Manders*.

Gomphandra pauciflora, *Craib* [Icacinaceae]; a *G. nyssifolia*, King, inflorescentia laxiore, ovario glabro, a *G. javanica*, Val., fructu haud sulcato distinguenda.

Arbor sempervirens, circiter 12 m. alta (ex *Kerr*); ramuli primo puberuli, mox glabri, cinereo-corticati. *Folia* oblongo-oblanceolata vel fere oblonga, apice acuminata, obtusa, basi plerumque parum inaequilatera, late cuneata, circiter 9–11 cm. longa, 3·2–5·3 cm. lata, chartacea, glabra, nervis lateralibus utrinque 5–7 supra conspicuis subtus prominulis, costa supra impressa subtus prominente, nervulis subtus subconspicuis, integra, petiolo 0·9–1·3 cm. longo supra canaliculato glabro suffulta. *Cymae* laxae, pauciflorae, ex axillis foliorum delapsorum ortae, pedunculo communi circiter 6 mm. longo suffultae; pedicelli 3 mm. longi, ut pedunculi sparse breviter adpresse albo-pubescentes. *Fl.* ♂. *Calyx* truncatus, integer, 0·75 mm. altus. *Corolla* alba (ex *Kerr*); tubus 2 mm. longus; lobi 6, e dorso visi deltoidei vel anguste deltoidei, ad 1 mm. longi, apice acuminati, acumine horizontali circiter 0·75 mm. longo. *Filamenta* 4 mm. longa, intra supra medium fere ad apicem dorsoque summo apice pilis longiusculis albis papillosis instructa, antheris parvis. *Pistillum* rudimentarium 1·5 mm. altum, glabrum. *Fl.* ♀. *Calyx corollaque* maris nisi corolla paulo longiore. *Staminodia* corollam paulo superantia. *Ovarium* 3 mm. altum, glabrum, stigmate sessili disciformi. *Fructus* ambitu oblongus, ad 2 cm. longus et ·8 mm. diametro.

Doi Wao, in evergreen jungle, 690–750 m., *Kerr* 2435 (♂), 2433 (♀).

Adenia viridiflora, *Craib* [Passifloraceae-Modecceae]; *A. cardiophyllae*, Engler, similis, sed foliis inferne haud integris, filamentis basi tantum connatis recedit.

Caules scandentes, cirrhosi, cortice stramineo vel cinereo longitudinaliter striato obtecti, glabri. *Folia* plus minusve ovata, apice obtusa, basi parum cordata, 4–9 cm. longa, 3·3–6 cm. lata, chartacea, pagina utraque glabra, nervis lateralibus utrinque 3–4 supra conspicuis subtus prominulis, nervulis uti reticulatione gracili subtus conspicuis, margine inferne grosse irregulariter crenato-serrato superne integro, petiolo 1–2·6 cm. longo apice glandula conspicua instructo suffulta. *Cymae* ♂ axillares, 2–3 cm. (pedunculo excluso) longae, glabrae, pedunculo communi 1·5–1·7 cm. longo suffultae; pedicelli graciles, circiter 9 mm. longi; bracteae parvae; flores pallide virides (ex *Kerr*). *Calycis* tubus 7 mm. longus, glaber; lobi 3·25 mm. longi, apice reflexi. *Petala* 6 mm. longa, 2·55 mm. lata, glabra. *Stamina* 5, filamentis inferne complanatis basi connatis ovariumque parvum rudimentarium laxe cingentibus; antherae 2·5 mm. longae, filamentis paulo longiores.

Mê Chang, in bamboo jungle, 330 m., *Kerr* 2340.

Lao name, Puk sap (ex *Kerr*).

Adenia pinnatisecta, *Craib*, comb. nov.—*Modecca pinnatisecta*, Craib in Kew Bull. 1911, p. 56, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 92.

Chiengmai, Doi Sutep, 720 m., *Kerr* 751.

Distr. Burma.

Eugenia Zimmermannii, *Warburg ex Craib* [Myrtaceae–Myrteae]; ab *E. densiflora*, Duthie, cui affinis, ramulis cinereo-corticatis, foliorum nervis inferioribus obliquis, inflorescentia laxiore recedit.

Arbor partibus omnibus glabra; ramuli primo quadrangulares, demum fere teretes, cortice pallide cinereo irregulariter longitudinaliter reticulato-striato obtecti. *Folia* plerumque oblanceolata vel oblongo-oblanceolata, apice inconspicue breviter acuminata, obtusa, basi late cuneata, cuneata vel attenuato-cuneata, ad 15 cm. longa et 4·5 cm. lata, coriaceo-papyracea, pellucido-punctata, nervis lateralibus utrinque 7–10 intra marginem anastomosantibus inferioribus satis obliquis omnibus cum costa supra subprominulis subtus prominentibus, nervulis oculo armato supra conspicuis subtus uti reticulatione gracili subprominulis, petiolo supra canaliculato latiusculo vel fere subalato ad 1·7 cm. longo suffulta. *Receptaculum* vix 5 mm. altum, apice 6 mm. diametro, basin versus attenuatum, glabrum. *Sepala* 3·5 mm. longa et 4·5 mm. lata. *Petala* alba (ex *Kerr*), 8·5 mm. longa, 7 mm. lata. *Filamenta* ad 1·1 cm. longa, glabra, antheris parvis. *Stylus* staminibus subaequilongus.

Bangkok, *Zimmermann* 160; Chiengmai, 300 m. (cultivated ?), *Kerr* 1855.

Hedyotis dimorpha, *Craib* [Rubiaceae-Hedyotideae]; ab affini *H. capitellata*, Wall., indumento facile distinguenda.

Caules volubiles, densius pubescentes vel tomentoso-pubescentes, demum fere glabri vel omnino glabri, cinereo-corticati. *Folia* lanceolata vel late lanceolata, apice acute acuminata, basi cuneata vel late cuneata, ad 8 cm. longa et 2·4 cm. lata, chartacea vel rigide chartacea, supra breviter parcius pubescentia, subtus pallidiora, molliter albo-pubescentia, nervis lateralibus utrinque 5 supra conspicuis vel leviter impressis subtus prominentibus, nervis transversis obscuris, margine revoluto, petiolo brevi suffulta; stipulae fimbriato-sectae, breves. *Inflorescentia* e capitulis in axillis foliorum superiorum solitariis et terminalibus vel ob folia superiora reducta racemosim dispositis ad 2·5 cm. diametro constituta. *Flores* dimorphi, 4–5-meri. *Receptaculum* 1·5 mm. altum, breviter parce pubescens. *Calycis* segmenta deltoidea, acuta, 1·5 mm. longa, dorso pilis albidis rectis parce instructa. *Corollae* tubus 1·5 mm. longus; lobi 5 mm. longi, basi fere 1·5 mm., apice 0·75 mm. lati, intra inferne pilis albidis rigidiusculis barbati, extra superne pilis paucis rigidis instructi. *Filamenta* in forma longistyla circiter 1 mm. longa, in forma brevistyla 5·5 mm. longa, antheris circiter 1·5 mm. longis. *Stylus* in forma longistyla 5·5 mm. longus, ramis 1·5 mm. longis, ima basi summoque apice glaber, medio pilis albidis rigidis adscendentibus instructus, in forma brevistyla 4 mm. (ramis inclusis) longus.

Pak Kawng, near Lakon, in scrub jungle, 360 m., *Kerr* 2310; Mê Ka Mi, trailing over low herbage in marshy ground, 360 m., *Kerr* 2379.

Distr. Upper Burma; Shan Hills Terai, 900 m., *Collett* 430.

Lao name, Kûa kao kûn? (ex *Kerr*).

Mycetia glandulosa, *Craib* [Rubiaceae-Mussaendeae]; a *M. longifolia*, K. Sch., calyce glanduloso distinguenda.

Fruticulus vix unimetralis (ex *Kerr*); ramuli primo breviter pubescentes, demum glabri, cortice stramineo nitido obtecti. *Folia* oblanceolata vel oblongo-oblanceolata, apice acuminata, acuta, basi cuneato-attenuata, saepe parum inaequilatera, 11·5–20 cm. longa, 2·8–5·5 cm. lata, chartacea, pagina utraque pilis rigidiusculis pallidis sparse instructa, nervis lateralibus utrinque circiter 30 plerumque arcuatis supra conspicuis subtus prominentibus, petiolo 4–8 mm. longo supra canaliculato ut ramulis pubescente suffulta; stipulae foliaceae, 6–8 mm. longae, circiter 5 mm. latae. *Inflorescentia* 5 cm. longa, 8 cm. diametro, ramis inferioribus 2 cm. longis, pedicellis circiter 5 mm. longis. *Receptaculum* vix 2 mm. altum, glabrum. *Calyx* glanduloso-fimbriatus, 1·5 mm. longus. *Corollae* luteae (ex *Kerr*) tubus 9·5 mm. longus, extra parce pubescens, intus villosus; lobi apice uncinati, circiter 1·5 mm. longi. *Stylus* 9·5 mm. (ramis inclusis) longus.—*Mycetia longifolia*, Craib in Kew Bull. 1911, p. 390 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 104, *non* K. Sch.

Chiengmai, Doi Sutep, in evergreen jungle, 660 m., *Kerr* 1148.

Mycetia gracilis, Craib [Rubiaceae-Mussaendeae]; a *M. cauliflora*, Reinw., cui affinis, foliis minoribus, floribus paucioribus, receptaculo glabro distinguenda.

Fruticulus circiter 1·5 m. altus (ex *Kerr*); ramuli primo puberuli, demum glabri, cortice pallido plerumque nitido obtecti. *Folia* oblanceolata vel late oblanceolata, apice acuminata, acuta, basi cuneata, 2·5–7·5 cm. longa, 0·8–1·8 cm. lata, chartacea vel membranaceo-chartacea, supra glabra, subtus costa nervisque puberula, nervis lateralibus utrinque circiter 10 supra conspicuis subtus prominulis, nervis transversis supra subconspicuis subtus subprominulis, petiolo brevi supra canaliculato suffulta; stipulae angustae, circiter 5 mm. longae. *Inflorescentia* e cymulis simplicibus 3-floribus constituta vel saepius ramulis duobus oppositis quoque bifloro inferne additis; pedunculus communis plerumque circiter 6 mm. longus; pedunculi laterales partiales 8–12 mm. longi; pedicelli graciles, 9 mm. longi; bracteae parvae. *Receptaculum* turbinatum, 2·5 mm. altum, apice 3 mm. diametro, glabrum. *Calycis* segmenta plus minusve linearia, acuta vel obtusiuscula, ad 2·5 mm. longa et 0·75 mm. lata. *Corollae* luteae (ex *Kerr*) tubus 1·4 cm. longus, intus pilosus, extra glaber; lobi ad 3 mm. longi et 1·5 mm. lati. *Filamenta* brevia, antheris 2 mm. longis. *Stylus* 1·1 cm. longus, parce pilosus, ramis 3 mm. longis. —*Mycetia cauliflora*, Craib in Kew Bull. 1911, p. 390 et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 104, *vix* Reinw.

Chiengmai, Doi Sutep, in evergreen jungle by stream, 900 m., *Kerr* 1833.

Dist. Upper Burma: Southern Shan States, *Macgregor* 674 (Herb. Calcutta!)

Mycetia rivicola, *Craib* [Rubiaceae-Mussaendeae]; ab affini *M. cauliflora*, Reinw., ramulorum indumento magis persistente, stipulis majoribus, inflorescentiae rigidioris indumento densiore recedit.

Fruticulus ad 1·2 m. altus (ex *Kerr*); ramuli primo breviter adpresse pubescentes vel subtomentelli, mox puberuli, demum glabri, cortice pallido plus minusve lenticellato obtecti, ad 6 mm. diametro. *Folia* oblanceolata, late oblanceolata vel oblongo-oblanceolata, apice plerumque breviter acute acuminata, basi attenuato-cuneata, ad 22 cm. longa et 6 cm. lata, chartacea, supra glabra, subnitida, subtus pallidiora, costa nervisque breviter adpresse pubescentia, nervulis puberula, nervis lateralibus utrinque plerumque 15–20 supra conspicuis vel subprominulis subtus prominentibus, nervis transversis pagina superiore conspicuis inferiore prominulis; petioli 6–10 mm. longi, supra canaliculati, indumento ut ramuli; stipulae mox deciduae, ad 7 mm. longae et 3·5 mm. latae, pallidae. *Inflorescentia* terminalis, e cymis paniculatim dispositis composita, circiter 4 cm. longa et 5 cm. diametro; bracteae stipulis subsimiles nisi minores; pedunculus communis brevis; pedunculi partiales oppositi, inferiores circiter 1·5 cm. longi, rigidi; pedicelli circiter 7 mm. longi. *Receptaculum* 2 mm. altum, pilis brevibus adpressis tectum. *Calycis* segmenta lanceolata, acuta, 3 mm. longa, 1 mm. lata, dorso plus minusve distincte uninervata parceque adpresse pubescentia. *Corollae* luteae (ex *Kerr*) tubus circiter 1 cm. longus, extra glaber, intus pilosus; lobi ad 2 mm. longi et 1·25 mm. lati, dorso superne parcius adpresse pubescentes. *Filamenta*

brevissima, antheris 1·75 mm. longis. *Stylus* 5·5 mm. longus, superne parce pilosus, ramis 4 mm. longis.

Chiengmai, Doi Sutep, in thick evergreen jungle by stream, 1650 m., *Kerr* 1869.

Gardenia Collinsae, *Craib* [Rubiaceae-Gardenieae]; a *G. lucida,* Roxb., nervis lateralibus utrinque circiter 10 recedit.

Ramuli glabri, cortice pallido laevi obtecti. *Folia* plerumque elliptica vel obovata, apice breviter obtuse acuminata vel rotundata, basi cuneata vel rotundato-cuneata, 2·5–6 cm. longa, 1·6–4·2 cm. lata, rigide chartacea, pagina utraque glabra, subtus pallidiora, pauperrime distanter ciliata, nervis lateralibus utrinque circiter 10 pagina utraque conspicuis vel fere subprominulis, nervis transversis oculo armato utrinque conspicuis, petiolo brevi suffulta; stipulae connatae, ad 8 mm. longae. *Flores* solitarii, breviter pedicellati, sicco lutei. *Receptaculum* 3 mm. altum, 2·25 mm. diametro, glabrum. *Calycis* tubus circiter 1·5 mm. longus; segmenta 7, viridia, angusta, acutiuscula, ad 1·1 cm. longa, pauperrime ciliata. *Corollae* tubus 2 cm. longus; lobi 6, parum variabiles, apice rotundati, ad 2·4 cm. longi, 0·7–1·1 cm. lati. *Stylus* superne fusiformis, vix 2·4 cm. longus, glaber; ovarii placentae duae.

Sriracha, near beach, *Mrs. D. J. Collins* 110.

Ixora cibdela, *Craib* [Rubiaceae-Ixoreae]; *I. grandifoliae,* Zoll. et Mor., facie similis sed inflorescentia glabra articulata recedit.

Frutex vel *arbuscula* parce ramosa, ad 4·5 m. alta (ex *Kerr*), ramulis brunneo- vel cinereo-brunneo-corticatis. *Folia* variabilia, oblongo-oblanceolata, oblonga vel oblongo-lanceolata, rarius fere ovata, apice obtusa, rarissime breviter acute acuminata, basi plerumque cuneata, ad 20 cm. longa et 6·5 cm. lata, coriacea vel subcoriacea, pagina utraque glabra, nervis lateralibus utrinque 10–14 supra subconspicuis subtus prominentibus, petiolo supra canaliculato 0·5–1·3 cm. longo suffulta; stipulae ad 6 mm. longae, diutius persistentes. *Inflorescentia* brachiata, subsessilis, glabra, articulata; ramuli inferiores ad 4·5 cm. longi; cymularum pedunculi circiter 2 mm. longi; flos terminalis sessilis, flores laterales pedicello pedunculo subaequilongo suffulti; bracteae bracteolaeque parvae. *Receptaculum* 1 mm. altum. *Calycis* segmenta apice rotundata, 0·5 mm. longa, inter se parum inaequalia. *Corollae* puniceae (ex *Kerr*) tubus usque ad 1·3 cm. longus; lobi oblongi, parum retusi, 6·5 mm. longi, 3 mm. lati. *Filamenta* 3 mm. longa, antheris 5·75 mm. longis. *Stylus* ad 4·5 mm. exsertus.—*I. grandifolia,* Zoll. et Mor., var *glabra,* Craib in Kew Bull. 1911, p. 394; Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 108.

Chiengmai, in eng jungle on Doi Sutep, 330–660 m., *Kerr* 530, 1706; Chiengmai, 300 m., *Hosseus* 178; Doi Chieng Dao, 400 m., *Hosseus* 469; Prê, 156–240 m., *Luang Vanpruk* 130.

Lao name, Dauk kem (ex *Kerr*).

Ixora Collinsae, *Craib* [Rubiaceae-Ixoreae]; ab *I. parviflora,* Vahl, petiolis longioribus, foliis basi plerumque cuneatis, inflorescentia glabra facile distinguenda.

Ramuli glabri, primo parum compressi, mox teretes, ad 4 mm. diametro, brunneo- vel pallide brunneo-corticati. *Folia* elliptica vel ovato-elliptica, rarius late oblongo-oblanceolata vel obovato-oblanceolata, apice breviter obtusissime acuminata, basi saepius cuneata vel late cuneata, 6·5–18 cm. longa, 1·7–7·7 cm. lata, chartaceo-coriacea, nervis lateralibus utrinque 10–12 intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis pagina utraque conspicuis vel inferiore fere subprominulis, margine plerumque leviter recurvo, petiolo 0·5–1·7 cm. longo supra canaliculato suffulta; stipulae e basi 4 mm. lata subulato-acuminatae, 7 mm. longae. *Inflorescentia* terminalis, sessilis, glabra; cymae brachiatae, articulatae; ramuli laterales inferiores ad 5 cm. longi, superiores ab inferioribus ad 6·5 cm. distantes, ad 2 cm. longi; bracteae bracteolaeque parvae; cymularum pedunculi ad 3·5 mm. longi, floribus terminalibus sessilibus, lateralibus pedicello 1·5 mm. longo suffultis; flores pallide punicei (ex *Collins*). *Receptaculum* 0·75 mm. altum. *Sepala* 4, vix 0·75 mm. longa, 0·75 mm. lata. *Corollae* tubus 6·5 mm. longus, lobi 4, oblongi, emarginulati, 3·5 mm. longi, 2·25 mm. lati. *Filamenta* 1·5 mm. longa, antheris 3·5 mm. longis. *Stylus* circiter 1 cm. longus, bifidus. *Fructus* brunneus, subglobosus, circiter 5 mm. diametro.

Sriracha, 4·5 m., *Mrs. D. J. Collins* 60.

Ixora Kerrii, *Craib* [Rubiaceae-Ixoreae]; ab *I. stricta,* Roxb., corollae tubo breviore eiusque lobis arcte reflexis distinguenda.

Frutex 1·5–2·4 metralis (ex *Kerr*), omnino glaber; ramuli primo parum compressi, mox teretes, ad 5·5 mm. diametro, cortice pallide brunneo reticulato-striato obtecti. *Folia* oblonga ad oblongo-ovata, apice breviter acuminata, obtusa, basi cuneata, obtusa vel rotundata, interdum leviter cordata, ad 21 cm. longa et 7 cm. lata, mox coriaceo-chartacea, nervis lateralibus utrinque circiter 11–14, supremis bene intra marginem anastomosantibus, pagina superiore conspicuis vel fere subprominulis inferiore prominentibus, nervis transversis uti reticulatione laxa pagina utraque oculo armato conspicuis, petiolo validiusculo 3–5 mm. longo suffulta; stipulae basi latiusculae, apice longe subulato-acuminatae, ad 1 cm. longae. *Inflorescentia* densa, ad 20 cm. diametro, sessilis vel pedunculo communi usque ad 5 cm. longo suffulta, articulata, glabra; ramuli inferiores 2·8–6 cm. longi; cymularum pedunculi breves, floribus sessilibus; bracteae bracteolaeque parvae. *Receptaculum* circiter 1 mm. altum. *Calyx* vix 0·5 mm. longus. *Corollae* puniceae (ex *Kerr*) tubus gracilis, 1–1·3 cm. longus; lobi reflexi, oblongi, apice rotundati vel parum retusi, circiter 2·5 mm. longi et 1·5 mm. lati. *Antherae* apice acuminatae, paululo ultra 3 mm. longae. *Stylus* gracilis, ad 1·6 cm. longus, glaber. *Fructus* purpureus (ex *Kerr*), plus minusve late ellipsoideus, 1 cm. altus, seminibus brunneo-stramineis. *Ixora* sp. near *I. stricta,* Roxb., Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 109.

Chiengmai, Doi Sutep, in evergreen jungle, 1350–1650 m., *Kerr* 1745, 1745A.

Leptodermis trifida, *Craib* [Rubiaceae-Paederieae]; a *L. lanceolata*, Bunge, foliorum nervis lateralibus paucioribus, stylo trifido recedit.

Frutex circiter 1·5 m. altus (ex *Kerr*); ramuli primo tenuiter bifacialiter pubescentes, mox glabri, cortice brunneo-stramineo parce lenticellato obtecti. *Folia* opposita et in axillis fasciculiformia (ramulis brevissimis axillaribus gesta), plerumque oblanceolata vel late oblanceolata, apice acuta, mucronata, basi cuneata, ad 2·2 cm. longa et 8·5 mm. lata, rigida, glabra, nervis lateralibus utrinque 4 pagina inferiore prominentibus, nervulis ob colorem caeruleum pagina inferiore conspicuis, margine recurvo, petiolo 2–3 mm. longo suffulta; stipulae late deltoideae, acutae vel acuminatae, ad 3 mm. longae, saepe divaricatae, dorso breviter pubescentes. *Bracteae* solitariae, late ovatae, cuspidato-acuminatae, acutae, 5 mm. longae, 3·5 mm. latae, uninervatae, dorso breviter pubescentes, ciliolatae; bracteolae omnino connatae, ad 4 mm. longae. *Receptaculum* 1·5 mm. altum, atrum, glabrum. *Sepala* 5, inter se subaequalia, 1 mm. longa, ciliata. *Corollae* lilacinae (ex *Kerr*) tubus 1·2 cm. longus, intus pilosus, extra puberulus; lobi ad 3·5 mm. longi. *Antherae* 2 mm. longae. *Stylus* 1·4 mm. longus, superne puberulus, trifidus.

Doi Chieng Dao, top of peak, 1770 m., *Kerr* 2873.

Craibiodendron stellatum, *W. W. Smith*, comb. nov. *C. shanicum*, W. W. Smith in Rec. Bot. Surv. Ind., vol. iv. p. 277; Craib in Kew Bull. 1911 p. 405; W. W. Smith in Notes Roy. Bot. Gard. Edin., vol. v. p. 157, pl. cviii.; Craib, Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57 p. 121. *Schima? stellata*, Pierre ex Lanessan Pl. util. Colon. Franç., p. 295; Pierre, Fl. Forest. Cochinch. pl. 122; Pitard in Lec. Fl. Indo-Chine, vol. i. p. 352.

Chiengmai, Doi Sutep, 360–840 m., *Kerr* 1282, 1282A, 1369.

Distr. Burma, S. China, Cambodia (Laos, ex *Fl. Indo-Chine*).

Christisonia siamensis, *Craib* [Orobanchaceae]; *C. Scortechinii*, Prain, facie persimilis sed squamis haud linearibus, corolla purpurea differt.

Herba subacaulis, ad 7-flora, glabra. *Squamae* ovatae vel oblongo-ovatae, 0·7–2·5 cm. longae. *Pedicelli* validi, usque ad 3 cm. longi. *Calyx* tubulosus, tubo 1·3–1·8 cm. longo et 1 cm. diametro; lobi interdum 2 tantum, interdum 4 vel 5, deltoidei vel late deltoidei, acuti, 0·5–1 cm. longi. *Corolla* circiter 6 cm. longa, tubo purpureo-suffuso, lobis pupureis (ex *Kerr*); tubi pars basalis 2·5 cm. longa, 4 mm. diametro, pars superior 1·3 cm. diametro; lobi manci. *Stamina* didynama, glabra, filamentis longioribus 1·4 cm. brevioribus vix 1 cm. longis, antherarum loculis 3·5 mm. longis; staminum inferiorum antherae appendice oblongo obtuso 7 mm. longo 2·5 mm. lato instructae. *Ovarium* glabrum, 6 mm. altum, 6 mm. diametro, stylo glabro 3·8 cm. longo, stigmate peltato 4 mm. diametro papillis minutis tecto.

Mê Nan, Sop Ngao, in bamboo jungle, 210 m., *Kerr* 2406.

Chirita Kerrii, *Craib* [Gesneraceae-Cyrtandreae]; habitu speciminibus minoribus *C. hamosae*, Don, similis sed bracteis connatis ad *C. rupestrem*, Ridl. eiusque affiniores proxime accedit.

Herba caule simplice 4–7 cm. alto apicem versus laxe piloso inferne glabrescente brunneo unifoliato vel haud rarius producto foliaque duo opposita semper folio inferiore conspicue minora gerente. *Folia* ovata vel late ovata, apice obtusa, basi plerumque cordata, 4–11·5 cm. longa, 2·8–7·3 cm. lata, membranacea, pagina utraque pilis albis hic illic instructa, inferiore pallidiora, ciliata, nervis lateralibus utrinque 8–10 infra conspicuis, petiolo 0·3–1·5 cm. longo supra praecipue piloso suffulta. *Cymae* pedunculo communi 5 mm. longo piloso suffultae, bracteis duabus inferne connatis late ovatis vel ovato-orbicularibus acutis vel brevissime acute acuminatis ad 1·2 cm. longis et 1·1 cm. latis ciliatis pauci-serratis ornatae; pedicelli 6 mm. longi, parce pilosi. *Calycis* segmenta lineari-lanceolata vel lanceolata, apice attenuata vel fere acuminata, acuta, 6·5 mm. longa, 1·5 mm. lata, ciliata, dorso parce pilosa. *Corollae* ventricosae tubus 1·2 cm. longus, lobi 5, apice rotundati, ad 4 mm. longi et 4·5 mm. lati. *Stamina* duo, inclusa, glabra. *Ovarium* 7 mm. altum, glabrum vel subglabrum, stylo circiter 6 mm. longo apice bifido parce pubescente; discus parvus.

Mê Ping Rapids, Fa Man, in crevices of damp rock, 180 m., *Kerr* 2194.

Ornithoboea lanata, *Craib* [Gesneraceae-Cyrtandreae]; a speciebus omnibus adhuc descriptis caule petiolis pedunculisque cinnamomeo-lanatis facile distinguenda.

Caulis simplex, 20–30 cm. altus, ad 5 mm. diametro, cinnamomeo-lanatus. *Folia* opposita, inaequilatera, ovata vel elliptico-ovata, basi inaequalia, latere altero rotundato cordato, altero latissime cuneato vel fere truncato parum cordato, ad 22 cm. longa et 11·7 cm. lata, membranacea, pagina superiore pilis brevibus sparse instructa, inferiore costa nervisque cinnamomeo-lanata, nervis lateralibus utrinque circiter 11 supra conspicuis subtus prominentibus, nervis transversis laxis oculo armato pagina utraque conspicuis, petiolo ad 6 cm. longo ut caule lanato suffulta. *Inflorescentia* axillaris, ut caulis dense cinnamomeo-lanata; pedunculus communis infructescens ad 2 cm. longus; pedicelli ad 1·5 cm. longi. *Calycis* infructescentis segmenta arcte reflexa, ad 9 mm. longa, circiter 2 mm. lata. *Capsula* circiter 1·8 cm. longa, valvis tortis; semina fusiformia, vix 0·4 mm. longa, nigra.

Doi Chieng Dao, on limestone rocks, 660 m., *Kerr* 2852.

Lao name, Ya kon sûa (ex *Kerr*).

Strobilanthes leucocephalus, *Craib* [Acanthaceae-Ruellieae]; a *S. Brandisii*, T. And., corolla breviore distinguendus.

Caules primo pilis longiusculis tecti, mox glabri, pallide brunneo-corticati. *Folia* ovato-elliptica vel oblongo-elliptica, apice plerumque acuminata, obtusa vel acutiuscula, basi acuminata ad late cuneata, ad 11·5 cm. longa et 5·3 cm. lata, chartacea, pagina superiore pilis longiusculis hic illic instructa, inferiore costa nervis nervulisque pilis longis parcius instructa, supra arctius breviter lineolata, nervis lateralibus utrinque ad 9 supra conspicuis subtus cum costa prominentibus, nervis transversis subtus prominulis, margine acumine excepto serrato-crenata, ciliata, petiolo ad 1 cm. longo suffulta. *Flores* violacei

(ex *Kerr*), in capitula circiter 1·5 cm. diametro sessilia vel breviter pedunculata conspicue albo-pilosa aggregati; bracteae e basi elliptica lineari-lanceolatae, obtusiusculae, 1·9 cm. longae, 6 mm. latae, inferne utrinque pilis albis longis dense barbatae, superne pilis brevioribus glanduloso-capitatis ornatae; bracteolae binae, 1·2 cm. longae et 2·5 mm. latae, indumento bractearum. *Calyx* ad 1 cm. longus, segmentis inter se parum inaequalibus dense longe albo-ciliatis. *Corolla* circiter 3 cm. longa (omnibus plus minusve mancis). *Ovarium* apice pilis longis albis densis ornatum.

Doi Din Deng, common in evergreen jungle by streams, 540–630 m., *Kerr* 2317.

Lao name, Kwi nu din? (ex *Kerr*).

Strobilanthes niveus, *Craib* [Acanthaceae-Ruellieae]; a *S. petiolari*, Nees, foliis crenulatis vel serrato-crenulatis haud serratis recedit.

Caules decumbentes, nodis inferioribus radicantes, ad 35 cm. alti, saepissime simplices, graciles, pilis albidis brevibus tecti. *Folia* opposita inaequalia, ovato-lanceolata, ovata, ovato-elliptica vel elliptica, apice breviter saepe inconspicue obtuse acuminata, basi cuneata, saepius decurrentia, 3–9·5 cm. longa, 1·5–4·3 cm. lata, chartacea, subtus pallidiora, subglabra, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominulis, nervis transversis subtus conspicuis, crenulata vel serrato-crenulata; petioli foliorum oppositorum plerumque inter se parum inaequilongi, ad 1·7 cm. longi, indumento ut caules. *Spicae* usque ad 8 cm. longae; bracteae ligulato-spatulatae, apice breviter recurvae, 7·25 mm. longae, 2·25 mm. latae, extra longe parce albo-pilosae, intus brevius pilosae, ciliatae; bracteolae binae, lineares, 4·25 mm. longae, 0·75 mm. latae, dorso pilosae, ciliatae. *Calyx* 9·5 mm. longus, segmentis inter se parum inaequalibus ciliatis dorso pilis brevibus albis sparse instructis praetereaque superne pilis longis albis ornatis. *Corolla* nivea (ex *Kerr*), saltem 2·3 cm. longa, parte tubi basi aequali circiter 1 cm. longa. *Filamenta* pubescentia. *Stylus* basi glaber, superne pilis albis brevibus adscendentibus sparse instructus.

Doi Wao, in evergreen jungle, 900 m., *Kerr* 2442.

Strobilanthes venustus, *Craib* [Acanthaceae-Ruellieae]; a *S. auriculato*, Nees, eiusque varietatibus inflorescentia laxiore bracteis majoribus recedit.

Fruticulus vix metralis (ex *Kerr*); ramuli primo flexuosi, quadrangulares, angulis primo acutis mox rotundatis, pilis divaricatis rigidis magis minusve instructi, cinereo-brunneo-corticati. *Folia* late oblanceolata vel oblongo-oblanceolata, apice acute acuminata, basi auriculata, auriculis ramulos amplectentibus, 7·5–20 cm. longa, 2–6 cm. lata, paribus oppositis inaequalibus, chartacea, supra costa dense ceterum parce pilosa, subtus costa nervis nervulisque parce pilosa, nervis lateralibus utrinque 12–14 supra conspicuis subtus prominentibus, nervis transversis supra vix conspicuis subtus prominulis, ciliata, serrulata vel denticulata, sessilia. *Spicae* circiter 4 cm. longae; bracteae spatulato-rotundatae, acuminatae, acumine reflexo, ad 1 cm. longae et fere

1 cm. latae, pagina utraque pilis albidis glanduloso-capitatis praetereaque dorso medio margineque pilis longis albis instructae. *Calycis* tubus 2 mm. longus; lobi inter se parum inaequales, ad 7 mm. longi, dorso pilis albis paucis breviusculis glanduloso-capitatis paucis longioribus instructi. *Corolla* violacea (ex *Kerr*), 3·5 cm. longa; tubi pars basi aequalis paulo ultra 1 cm. longa; lobi usque ad 5 mm. longi et 7 mm. lati. *Filamenta* longiora 6 mm. longa, breviora 1·5 mm. longa. *Stylus* glaber.

Chiengmai, cultivated in Forestry compound, supposed to have been brought from the jungle, *Kerr* 2296.

Plectranthus Garrettii, *Craib* [Labiatae-Ocimoideae]; a *P. calcarato*, Hemsl., cui valde affinis, foliorum indumento distinguendus.

Caules primo densiuscule crispatim piloso-pubescentes, pilis mox plus minusve deciduis, nodis inferioribus saepe radicantes, internodiis usque ad 7 cm. longis. *Folia* ovato-lanceolata vel lanceolata, rarius obovata, apice brevissime acuminata, acuta vel cum obovata rotundata, basi cuneata, latissime cuneata vel rotundato-cuneata, 1·3–3·8 cm. longa, 0·7–2·6 cm. lata, membranaceo-chartacea vel chartacea, pagina utraque sed superiore densius pilis validiusculis instructa, crenato-serrata, petiolo usque ad 1·5 cm. longo indumento ut caule instructo suffulta. *Flores* in verticillastris racemosim dispositis; bracteae 3·5 mm. longae; pedicelli ad 5 mm. longi. *Calyx* bilabiatus, lobis omnibus pilis glanduloso-capitatis ciliatis; labium superum apice rotundatum, sub anthesin 2 mm. longum, 2 mm. latum, in fructu paulo majus, inferum 2 mm. longum, 1·5 mm. latum, post anthesin accrescens; lobi laterales breves, rotundati. *Corolla* 2·1–2·3 cm. (calcare 7–9·5 mm. longo incluso) longa; labium superum breviter 4-lobatum, lobis lateralibus medianos paulo superantibus, inferum oblongum, apice rotundatum, fere 4 mm. longum, 2 mm. latum. *Filamenta* longiora 1·05 cm. longa, breviora 4 mm. longa, omnia glabra. *Stylus* 1·3 cm. longus, glaber, apice breviter bifidus. *Nuculae* 1·25 mm. altae, paulo ultra 0·75 mm. diametro, fuscae, glabrae, minutissime punctatae.

Doi Intanon, Pah Ngeam, 1142 m., *Garrett* 65.

XX.—DIAGNOSES AFRICANAE: LVIII.

1491. **Anacampseros rhodesica,** *N. E. Brown* [Portulacaceae]; affinis *A. ustulatae*, E. Mey. sed humilior, ramis simplicibus, stipulis cuspidatis squarrosis argenteis differt.

Herba perennis, dense caespitosa, 1–3 cm. alta, argentea, omnino glabra. *Rami* erecti, simplices, 4–10 mm. longi, 3 mm. diametro, cylindrici, obtusi vel acuti, stipulis argenteis densissime obtecti. *Folia* sessilia, stipulis occulta, 1 mm. longa, 1·5–2 mm. lata, transverse elliptica vel reniformia, integra, carnosa. *Stipulae* dense imbricatae, 2·5 mm. longae, 2 mm. latae, ovato-orbiculares, breviter cuspidatae, squarrosae, submembranaceae, argenteae. *Flores* terminales, solitarii, sessiles, bracteis amplectantibus occulti. *Bracteae* 4–7 mm. longae, ovato-lanceolatae,

acutae, erectae, imbricatae, argenteae. *Sepala* 3 mm. longa, 2 mm. lata, ovata vel elliptico-ovata, subacuta vel obtusa, membranacea vel petaloidea, albida vel carneo-albida. *Petala* 5, alba vel carneo-alba, 2·5 mm. longa, 1·5–1·75 mm. lata, elliptica vel elliptico-oblonga, obtusa. *Stamina* 6; filamenta basi brevissime connata, glabra; antherae 1·5 mm. longae, dorsifixae, luteae. *Ovarium* globosum, glabrum; stylus 1·25 mm. longus; stigma simplex. *Capsula* 4 mm. longa, oblonga, 4-valvis.

Tropical Africa. Rhodesia: Matopo, *J. G. McDonald, W. E. Dowsett;* Salisbury, *H. G. Mundy.*

This curious little plant presents the appearance of a tuft of short silvery cylindric stems arising from a fleshy tuberous root, without evidence of leaves or expanded flowers. The leaves are minute, and concealed under the small silvery scales which clothe the stem, and the flowers are concealed by the bracts which wrap round them in bud-like form at the tips of the branches. It was first sent to Kew by Mr. J. G. McDonald, as being used by the natives as a remedy for blackwater fever. The natives are said to brew it and throw away the first brew, using the second brew for severe cases, and the third for mild ones. Subsequently it was received from Mr. H. Godfrey Mundy, of Salisbury, Rhodesia, under the native name of "Qilika," as being used extensively in the manufacture of intoxicating liquors, but its use will probably be prohibited by law, as it is found to be deleterious. Dr. R. Marloth, in his *Flora of South Africa*, vol. i., records that *A. ustulata*, E. Mey., is also used by the natives in the making of a kind of beer, and for preparing a yeast. I have also been informed that *A. papyracea*, E. Mey., is used to make an intoxicating drink. As these three species are allied to one another, and all have the same general habit, they probably have similar medicinal properties. If the flowers of these species ever expand they must remain open for a very short time. All the parts are fully developed, but I have never seen an expanded flower of *A. ustulata* or *A. papyracea*, although I have seen and had them under cultivation for some years. Freshly gathered specimens of *A. rhodesica* in full flower have been sent in fluid to Kew by Mr. W. E. Dowsett, but all the flowers were unopened, although sepals, petals, stamens and ovary were fully developed. Ripe seeds are, however, freely produced.

1492. **Helichrysum eriophorum,** *Conrath* [Compositae-Inuloideae]; affine *H. lanato*, Harv., a quo foliis angustioribus capitulisque minoribus differt.

Caulis erectus, simplex, 30–35 cm. altus, ut folia appresse griseo-lanatus, usque ad inflorescentiam foliatus. *Folia* sessilia, oblongo-lanceolata, in basin sensim angustata, apice acuto recurvato saepe glabrescente; folia intermedia ceteris longiora et latiora, usque ad 8 cm. longa, ad 1·4 cm. lata, 5–nervia, inferiora breviora, superiora angustiora. *Inflorescentia* circiter 2·5 cm. diametro. *Capitula* in corymbum densissimum globosum congesta, sessilia, oblongo-ovoidea, 3·5–4 mm. longa, 1·5 mm. crassa, 10–12–flora. *Involucri bracteae* pluriseriatae, citrinae, oblongo-lanceolatae, longe acute acuminatae, basi lanatae. *Achaenia* glabra. *Pappi* setae pilis longis appressis.

South Africa. Transvaal: rocks near Irene, *Conrath* 432.

1493. **Senecio urophyllus,** *Conrath* [Compositae-Senecionideae]; affinis *S. bupleuroidi*, DC., a quo foliis non auriculatis differt.

Herba rigide erecta, 9–10 dm. alta. *Caulis* basi collo lanato, ramosus, valde sulcatus, glaber. *Folia* sessilia, firma, versus basin caulis congesta, superna distantia, inferiora oblongo-lanceolata, sensim acuminata, basi semi-amplexicaulia, usque ad 17 cm. longa, 1·5 cm. lata, margine subreflexo, integra vel inconspicue remote denticulata, subtus nervo medio prominente lateralibus prominulis; folia intermedia basalibus similia sed basi breviter decurrente; folia superiora oblongo-elliptica, in acumen longum angustum abrupte contracta, basi rotundata vel subdecurrentia. *Inflorescentia* corymbosa, ramis elongatis iterum ramosis; bracteae parvae, acuminatae; pedunculi proprii capitulorum 0·5–4 cm. longi. *Capitula* mediocria, 5–7 mm. diametro, radiata, multiflora. *Involucri bracteae* biseriatae, exteriores paucae lineares interioribus multo breviores, interiores 12–14, oblongo-cuneatae, 4–5 mm. longae, glabrae, apice brevi cuspidato recurvo. *Flores* disci involucrum superantes, ei radii involucro altero tanto longiores. *Corolla* florum radii limbo late ligulari 5 mm. longo 2 mm. lato. *Achaenia* glabra.

South Africa. Transvaal: Modderfontein, *Conrath* 1202.

1494. **Wahlenbergia multiflora,** *Conrath* [Campanulaceae-Campanuleae]; affinis *W. ramulosae*, E. Mey., a quo habitu elatiore, ramis sparsius indutis minus divergentibus, floribus majoribus recedit.

Planta annua, e basi ipsa ramosissima. 3–5 dm. alta. *Rami* supra trientem inferiorem valde ramosi, plerumque undulati, graciliusculi, teretes, sparse pubescentes vel subglabri, multifoliati. *Folia* alterna, sessilia, suberecta, linearia, obtusiuscula, 3–7 mm. longa, 0·5–1 mm. lata, sparse denticulata vel integra, margine leviter incrassato, inferiora internodia aequantia, superiora breviora. *Pedicelli* 5–7 mm. rarius ad 9 mm. longi, graciles. *Receptaculum* fere hemisphaericum, glabrum, vix 1 mm. longum, cum calycis segmentis 3–4 mm. metiens. *Calycis segmenta* e basi triangulari lineari-subulata, obtusiuscula, marginibus saepius inconspicue remote denticulata, glabra. *Corolla* anguste infundibuliformis, 6–7 mm. longa, quinqueloba; tubus 4–5 mm. longus; lobi triangulares, acuti, 2 mm. longi. *Stylus* inferne sparse pilosus, infra stigmata 3 eglandulosus. *Capsula* breviter ovoidea, circiter 1·2 mm. longa, valvis tribus dehiscens.

South Africa. Transvaal: Modderfontein, in Eucalyptus plantations, *Conrath* 563.

1495. **Harveya crispula,** *Conrath* [Scrophulariaceae-Gerardieae]; affinis *H. Bodkini*, Hiern, a qua corollae tubo breviore ampliore recedit.

Planta herbacea, sordide obscure purpurea. *Caulis* 1–2 cm. longus, herbaceus, squamosus, glaber, foliis praeter squamas carens, 1–2-flora. *Squamae* appressae, obovatae, basi cuneatae,

2–2·5 mm. longae et latae. *Flores* singuli vel bini, subsessiles, magni. *Bracteae* obovatae vel obovato-oblongae, 12–13 mm. longae, 5–6 mm. latae, obtusiusculae, extra sparse (marginibus superioribus dense) crispule breviter pilosae, calycis dimidium aequantes vel minores; bracteolae 2, liberae, calycis basi insertae, erectae, oblongo-lineares, bracteis longiores, 15–16 mm. longae, 1·5 mm. latae, extra densiuscule crispule pubescentes. *Calyx* late tubuloso-infundibuliformis, 2·5–2·8 cm. longus, extra pilis longis septatis laxe appressis in lobis pilis crispulis densius indutus, superne bilabiatus; lobi 5–8 mm. longi, 3 superiores inter se similes, triangulari-oblongi, acuti, 2 inferiores longiores et latiores sinu profundiore. *Corolla* late tubulosa, superne quinquelobata, 4–4·5 cm. longa; tubus in basin sensim angustatus, inferne satis rectus, dorso gibbosus, sparse breviter pilosus, dorso et superne pilis longioribus crispulis septatis indutus, intus asperulus; limbus patulus, inconspicue bilabiatus, basi crispule pilosus, marginibus saepius crispule pilosus ceterum intus glabriusculus; lobi inter se subsimiles, late ovato-orbiculares, 11–13 mm. diametro, margine inconspicue remote undulato. *Filamenta* pilis brevibus rigidis crassis basi valde superne sparse induta, breviora 1·2 cm. longa, longiora 1·6 cm. longa; antherae biloculares, glabrae, 2–3 mm. longae, loculo longiore recto rostro longiore pallidiore, loculo breviore latiore semicirculari breviter apiculato. *Stylus* staminibus aliquanto longior, corollae tubo brevior, 1·7–1·8 cm. longus; stigma rotundatum, fere 2 mm. latum.

South Africa. Transvaal: Irene, *Conrath* 966.

1496. **Gladiolus atrorubens,** *N. E. Brown* [Iridaceae-Ixieae]; affinis *G. atropurpureo*, Baker, sed foliis multoties longioribus, floribus minoribus lobis minus inaequalibus facile distinguitur. *Caulis* 50–65 cm. altus, gracilis, leviter compressus, glaber. *Folia* circa 5, erecta, inferiora 22–40 cm. longa, 3–5 mm. lata, superiora gradatim minora, linearia, acuminata, glabra. *Spica* 4–7 cm. longa, 4–9-flora. *Bracteae* 8–10 mm. longae, oblongo-ovatae, acutae vel obtusae, scariosae, pallide brunneae. *Corolla* 2·5 cm. longa, 1·5 cm. diametro, leviter oblique infundibuliformis, leviter curvata, atrorubra (siccata nigrescens); tubus 1·5 cm. longus; lobi subaequales, 1 cm. longi, 6 mm. lati, elliptici, obtusi.

South Africa. Transkei: near Manubi, *W. F. Saxton*. Mr. Saxton states that the flowers of this species are dark red, but when dried they are almost black.

1497. **Anthericum erythrorrhizum,** *Conrath* [Liliaceae-Asphodeleae]; affinis *A. hirsuto*, Thunb., a quo capsula molliter setosa recedit.

Radicis fibrillae miniatae. *Caulis* rigide erectus, 5–7 dm. altus, simplex vel superne ramis nonnullis longis, teres, breviter patenter sparse puberulus. *Folia* plura, basi caulis conferta, late linearia, usque ad 30 cm. longa, 3–9 mm. lata, apice rotundata, utrinque praecipue subtus sparse breviter pilosa, marginibus brevius densius indutis, utrinque nervis multis longitudinalibus exsiccando elevatis. *Bracteae* scariosae costa valida fusca excepta, triangulari-lanceolatae, acutae, dimidium pedicelli aequantes,

circiter 3 mm. longae, plerumque ciliatae; pedicelli ascendentes, rigidi, perianthio aequilongi vel breviores, 4–6 mm. longi, sub fructu ad 11 mm. longi. *Perianthium* 7–8 mm. longum; tepala oblonga, alba, costa valida brunnea. *Filamenta* teretia dentibus retrorsis dense asperata, quam antherae altero tanto longiora. *Stylus* teres, laevis, antheras paullo superans, perianthio brevior. *Capsula* obovato-orbicularis, 4 mm. diametro, setis crassiusculis mollibus acuminatis dense obtecta.

South Africa. Transvaal: Modderfontein, by a stream, *Conrath* 777.

1498. **Rynchospora angolensis,** *Turrill* [Cyperaceae-Rynchosporeae]; *R. glaucae*, Vahl, affinis sed foliis setaceis, inflorescentia laxiore, inflorescentiis partialibus majoribus, nucibus majoribus differt.

Planta caespitosa, culmis numerosis erectis usque ad 4·5 dm. altis glabris. *Folia* setacea, apice acuta, usque ad 14 cm. longa et 0·5 mm. diametro, glabra; vaginae integrae, glabrae. *Inflorescentia* laxe paniculata, inflorescentiis partialibus 2–9; bracteae setaceae, 3 mm. longae, basi vaginatae; inflorescentia partialis 9 mm. longa, 2·5 mm. diametro, glabra, brunnea, e floribus circiter 4 constituta. *Glumae* inferiores steriles, elliptico- vel oblongo-lanceolatae, apice acutae, 4–5 mm. longae, 1–1·5 mm. latae, superiores fertiles, ovato-lanceolatae, apice acutae vel leviter acuminatae, 6·5 mm. longae, 3·5 mm. latae. *Stamina* 3, antheris linearibus 4 mm. longis. *Setae* 6 (vel 7), 6 mm. longae, breviter plumosae. *Ovarium* 1·25 mm. altum, 0·4 mm. diametro; stylus (parte inferiore 1·5 mm. longa inclusa) 6 mm. longus, glaber, integer. *Nux* biconvexe elliptico-oblonga, 3 mm. alta, 1·75 mm. diametro, transverse rugosa, glabra, styli basi dilatata persistente 2 mm. longa coronata.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3268.

1499. **Scleria angolensis,** *Turrill* [Cyperaceae-Sclerieae]; affinis *S. Hildebrandtii*, Boeck., sed nucibus majoribus facile distinguenda.

Rhizoma horizontale, squamis brunneis valde nervosis haud fibrosis obtectum. *Culmi* erecti, numerosi, triangulares, 1·5 mm. diametro, leviter pubescentes vel glabri, parte inferiore foliorum vaginis integris leviter pubescentibus obtecti. *Folia* linearia, apice acuta, usque ad 2·5 dm. longa et 3·5 mm. lata, pagina superiore aspera, costa impressa, nervis lateralibus inconspicuis. *Inflorescentia* foliis brevior, circiter 5 cm. longa et 1 cm. diametro, inflorescentiis partialibus circiter 8; bracteae lanceolato-lineares, basi vaginantes, apice longe acuminatae. *Inflorescentia partialis* mascula (spicula) circiter 10-flora, basi glumis vacuis 4; florum fertilium glumae oblongo-lanceolatae, apice acutae, 6 mm. longae, 2·5 mm. latae. *Stamina* 3, filamentis 7 mm. longis. *Inflorescentia partialis* foeminea (spicula) 1·6 cm. longa, 2·5 mm. lata, uniflora, basi glumis vacuis 5–6 longe acuminatis; gluma fertilis ovato-lanceolata, apice acuta, 8 mm. longa, 5 mm. lata. *Discus* 1 mm. altus, glaber. *Ovarium* cylindricum, 2 mm. altum, 1 mm. diametro, glabrum; stylus (cum stigmatibus) 1·3 cm. longus, infra

glaber, superne adpresse hirsutus; stigmata 3, 5 mm. longa. *Nux* ovoidea, 5 mm. alta, 3·5 mm. diametro, laevis, alba.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 4115.

1500. **Scleria induta,** *Turrill* [Cyperaceae-Sclerieae]; affinis *S. Barteri*, Boeck., sed spiculis longioribus, nucibus majoribus praecipue distinguitur.

Rhizoma horizontale, squamis brunneis valde nervosis haud fibrosis obtectum. *Culmi* erecti, numerosi, triangulares, circiter 6 dm. alti, 2·5 mm. diametro, hirsuti, parte inferiore foliorum vaginis integris distincte hirsutis obtecti. *Folia* linearia, apice acuta, usque ad 2·3 dm. longa et 4 mm. lata, plus minusve hirsuta vel fere glabra, pagina superiore sulcata, costa valde impressa, nervis lateralibus conspicuis, inferiore costa acute carinata nervis lateralibus inconspicuis. *Inflorescentia* plus minusve ovoidea, circiter 5·5 cm. longa et 3·5 cm. diametro; rhachis hirsuta; bracteae inferiores foliis similes, superiores anguste lineares, hirsutae. *Inflorescentia* partialis mascula (spicula) circiter 14-flora, 9 mm. longa, 2 mm. lata, basi glumis vacuis 4 longe acuminatis instructa; florum fertilium glumae oblongo-lanceolatae, circiter 7 mm. longae et 2 mm. latae. *Stamina* 3, antheris linearibus apiculatis 4 mm. longis, filamentis 6 mm. longis. *Inflorescentia partialis* foeminea (spicula) 1·4 cm. longa, 2 mm. lata, uniflora, basi glumis vacuis 6 acuminatis instructa; gluma fertilis ovato-lanceolata, 1 cm. longa, 6 mm. lata. *Discus* 0·75 mm. altus, glaber. *Ovarium* cylindricum, 2·5 mm. altum, 1 mm. diametro, glabrum; stylus glaber; stigmata 3. *Nux* ovoidea, 4 mm. alta, 2·5 mm. diametro, laevis, alba.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3658, 3757.

XXI.—MISCELLANEOUS NOTES.

Mr. H. W. Jack.—Mr. H. W. Jack, B.A., B.Sc., of University College, Cork, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant Agricultural Inspector in the Federated Malay States.

Mr. M. Free.—We are informed that Mr. M. Free, formerly a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed Head Gardener of the Brooklyn Botanic Garden, New York.

Mr. H. E. Downer.—We learn that Mr. H. E. Downer, formerly a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed, on the recommendation of Kew, Head Gardener at the Botanic Gardens, Smith College, Northampton, Mass., U. S. A.

Presentation of a portrait of Linnaeus.—A framed portrait of Linnaeus has been presented to the Herbarium by Sir Arthur Church, K.C.V.O. It is a very good impression of an old French colour-print by P. M. Alix after A. Roslin, and bears the imprint "A Paris chez Drouhin, Editeur & proprietarie des Antiquities Nationales, Rue Christine No. 2, et imprimes chez lui par Bechet." The portrait is a half-length one and represents Linnaeus clad in wig and dark fawn-coloured coat and vest, through the opening of the latter protrudes a delicate white frill, while on the left-hand side of the coat hangs the Order of the Polar Star, with a sprig of *Linnaea borealis* above it. The figure is turned slightly to the left, and its face is directed towards the spectator; the whole is enclosed in an oval $9\frac{3}{4}$ in. by $8\frac{1}{4}$ in. The picture bears some resemblance to that by A. Roslin in the Royal Swedish Academy of Sciences at Stockholm (but laterally inverted), a print of which has been published in the Proceedings of the Linnean Society of London, 1905–6, plate 8.

Botanical Magazine for March.—The plants figured are *Aristolochia gigantea*, Mart. (t. 8542); *Ribes laurifolium*, Janczewski (t. 8543); *Salvia uliginosa*, Benth. (t. 8544); *Kniphofia carinata*, C. H. Wright (t. 8545) and *Cotoneaster turbinata*, Craib (t. 8546).

Aristolochia gigantea is a Brazilian species, a plant of which has been presented to the Kew collection by Sir Frank Crisp. From this has been obtained the material for the illustration. The flowers are mainly brownish-purple, with pale yellow reticulations, and are noteworthy on account of their fragrance, thus being markedly different from the other species in cultivation. The perianth-limb is deeply cordate, has no tail, and is 9 in. long by about 6 in. wide. In the Palm House at Kew the plant is trained against the roof and forms annual shoots 15 ft. or more in length.

Ribes laurifolium has been introduced as a result of Mr. E. H. Wilson's mission to China on behalf of the Arnold Arboretum. Seeds were collected in Western Szechuan, and some were presented by Professor Sargent to Kew, to the Royal Botanic Garden, Glasnevin, and to Mr. Vicary Gibbs. The material for the figure was obtained from all of the three sources named. It is an unarmed shrub, with ovate or ovate-oblong serrate-crenate coriaceous leaves, $2\frac{1}{4}$–4 in. long, $\frac{1}{4}$–2 in. wide, pendulous racemes, 1–$1\frac{3}{4}$ in. long, of greenish flowers, and reddish tomentose broadly elliptic fruits about $\frac{2}{3}$ in. long. The plant is quite hardy in the British Islands, but so far has proved of slow growth.

The *Salvia* is an attractive species, native of Brazil, Uruguay and Argentina, and hardy at Kew, to which a plant was presented in 1912 by Mr. P. L. de Vilmorin, of Verrières, Seine and Oise. The stem of *S. uliginosa* is conspicuously sulcate quadrangular—a characteristic feature, as well as that of the deep serration of the leaves. Its flowers are bright blue, with some white marks on the base of the lip, and are borne in compact terminal spiciform racemes.

Kniphofia carinata is a new species allied to *K. comosa*, Hochst., from which it differs in having yellow filaments almost as long again as the perianth. Seeds of this plant were sent to Kew in 1892 by Miss Ayliff, of Grahamstown, South Africa, but flowers were not produced till September, 1912. It appears to be less hardy than the majority of Kniphofias in cultivation.

Cotoneaster turbinata is another addition to a genus of which our knowledge has increased considerably during recent years as a result of the more thorough botanical exploration of China. This species is a native of Hupeh, and the first plants obtained in Europe were raised from seeds sent by the Abbé Farges to Mr. M. L. de Vilmorin, from whom the Kew plants were received in 1910. It appears to be a hardy and vigorous species, and is of particular value in the garden on account of its habit of flowering six to eight weeks later than any other cultivated *Cotoneaster*.

Botanical Magazine for April.—The plants figured are *Hibiscus Waimeae*, A. A. Heller (t. 8547); *Gladiolus Masoniorum*, C. H. Wright (t. 8548); *Berberis Prattii*, C. K. Schneider (t. 8549); *Olearia semidentata*, Dene. (t. 8550) and *Epidendrum profusum*, Rolfe (t. 8551).

The *Hibiscus* is a remarkably beautiful plant from the Hawaiian Archipelago which was obtained for the Kew collection by purchase under the name of *H. Arnottianus* in 1911 from a Californian Nursery company. The flowers are large and pure white, with a conspicuous crimson, lax staminal column. *H. Waimeae* belongs to the group of species which includes *H. Rosa-sinensis*, Linn., and has been named *Lilibiscus* by Hochreutiner. An account of *H. Arnottianus* and the confusion that has arisen in connection with the name was published in *K. B.*, 1914 pp. 45–47.

Gladiolus Masoniorum was discovered in Tembuland in December, 1910, by Canon G. E. Mason of Umtata, and his sister Miss M. H. Mason, in compliment to both of whom it has been named. Material was sent to the Cambridge Botanic Garden, and the plant which flowered there furnished material for the plate. The flowers are cream-coloured with a greenish tint inside the lower part of the tube. *G. sulphureus*, De Graaf (*see* t. 7791), is the nearest ally of the Tembuland Gladiolus.

Berberis Prattii is yet another of the many interesting and beautiful plants of this genus recently introduced from China. This species is a native of Western Szechuan, and was first collected by Mr. A. E. Pratt near Tachien-lu, and later was found by Mr. E. H. Wilson. This species was originally included in *B. polyantha*, Hemsl., but Schneider separates it on account of its less closely reticulated leaves and narrower inflorescences. It very closely resembles *B. paniculata*, C. K. Schneider, with which it is often confused, but may be easily distinguished by the lower surface of leaves being pale green and not glaucous. It is a remarkably effective plant when the branches are laden with the salmon-red fruits in September.

The specimens of *Olearia semidentata* which afforded material for the plate were yielded by plants brought from the Chatham

Islands to Tresco by Captain A. A. Dorrien Smith, and a plant flowered in July, 1913. *O. chatamica*, T. Kirk, already figured in the Magazine (t. 8420), is the nearest ally to this species, and grows in association with it in boggy places in the Chatham Islands. In its native habitat *O. semidentata* exists in two colour varieties, according to Capt. Dorrien Smith, one having white and the other pink flowers. The plant figured bears the purple flowers of the type.

Epidendrum profusum is a very attractive orchid which was obtained for the Kew collection by purchase from Messrs. Sander and Sons, St. Albans, in 1911. It is assumed that its native country is Mexico since it was introduced under the name *E. Candollei*, Lindl., which is that of a Mexican species. (*E. Candollei* was figured at t. 3765 of the Magazine under the name *E. cepiforme*, Hook). *E. profusum* is most closely allied to *E. aromaticum*, Batem., and to *E. ambiguum*, Lindl., but differs from the latter especially in having a denser panicle with shorter and broader sepals and petals.

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* **Rubber.**—The history of the development of the important Para Rubber industry in the East teems with interest and more or less with romance. The initial difficulties of procuring seeds in the Seventies from the Amazon region, the raising of plants at Kew, and their despatch to our Eastern Colonies are facts of common knowledge. During more recent years, as the acreage under rubber increased and the industrial applications of the product extended, the need for trustworthy works of reference and guidance to planters has been met, and good standard works on the subject are now available at low cost.

In "Rubber and Rubber Planting," by Dr. R. H. Lock, we have a concisely written book embracing the whole subject from the early history of the use and cultivation of rubber, botanical sources, physiology of latex production, tapping experiments, planting, harvesting, factory work on the estate, pests and diseases, chemistry of rubber, manufactures, etc.

The aim of the author has been "to combine an accurate account of the scientific side of rubber planting with a certain amount of practical information which may be of use to the prospective planter." The chapters on the physiology of latex are largely the outcome of original observations, whilst those on the subjects of planting, harvesting and factory work on the estate are likewise based on a close personal acquaintance with the industry in Ceylon. The book has a number of useful illustrations and a good index, and forms a most useful addition to the literature of rubber.

J. M. H.

† **Cocoanuts.**—Probably at no other time than the present has

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* Rubber and Rubber Planting, by R. H. Lock, Sc.D., pp. xi. and 245, with 10 plates and 22 text figures. Cambridge, at the University Press, 1913. 5s. net.

† Coconuts: The Consols of the East, H. Hamel Smith and F. A. G. Pape, pp. lxviii and 644, with illustrations and index, London Tropical Life Publishing Department.

so much attention been directed to the vegetable kingdom for new sources of seeds yielding edible fatty oils and also to the extended cultivation of those already of commercial importance.

In the Palm family there are many fruits with oily kernels that might be applied to industrial use, but, generally speaking, there are difficulties in the way of obtaining regular supplies in quantity, and the fruits being often extremely hard in texture, special machinery, which is not always available, is needed to extract the kernels without damage.

With regard to Copra, which is the dried kernel of the Cocoanut Palm (*Cocos nucifera*), there is an increasing demand for the product, and during the last few years the extended cultivation of this palm has been most marked.

The uses to which all parts of the Cocoanut Palm are applied in the tropics are too numerous to give even a brief outline of them in this note, but in western commerce, beyond the fibre known as Coir, obtained from the husks, the nuts, kernels and oil extracted therefrom, comparatively little is known.

The recently published book "Coconuts, the Consols of the East," is a handy volume dealing primarily with the subject of cocoanut cultivation and the preparation of its products for the market. In addition, many important subjects are discussed of general interest to the planter. In the introduction the subject of "Health in the Tropics" forms not the least important feature of the book. This is followed by chapters dealing with the cost of a cocoanut estate, native ownership and husbandry, locality and site, cocoanut cultivation in Ceylon, Malaya, West Indies, Philippines, etc.; cleaning and preparing the land for planting, care and upkeep, diseases, catch crops and cover plants, Copra and its preparation. Other subjects handled are farming with dynamite, extraction of oil, mechanical extraction of fibre, spraying machines, etc.

From the foregoing it will be seen that the work covers a wide field of subjects; some of the illustrations are rather poor, but the book is well printed, has an excellent index, and should certainly form a valuable handbook to the planter and others interested in tropical produce.

J. M. H.

Atlas of the Flora of Algeria.—It is a pleasure to record the continuation of the "Atlas de la Flore d'Algérie." Commenced by Battandier and Trabut as "Atlas de la Flore d'Alger" in 1886, it was continued in 1895 by the same authors as "Atlas de la Flore d'Algérie," with fascicle 2 (plates 12–23) with which it ceased for the time. Now it has been taken up again by Professor Trabut, who carries it to plate 46 (fascs. 3 and 4, plates 24–46).

In the preface to the first fascicle it was stated that the Atlas would be confined to plants not figured elsewhere, and further that accuracy and analytical detail rather than artistic perfection would be aimed at, so that the price could be kept low enough for the many. The same principle has been applied to the present fascicle and even extended to the mode of reproduction which

varies almost from plate to plate, but is mostly done by some sort of photographic process. It may be regretted that there was not sufficient financial support forthcoming for a handsomer and more uniform mode of publication; but in the absence of it, the author deserves all credit for this valuable supplement to Battandier and Trabut's "Flore de l'Algérie. O. S.

The Date Palm.*—The present book, which is no doubt the most important publication on the subject, is based on a considerable amount of literary research and practical experience gained in the date palm plantations of California and Arizona, and on observations made by the author during two years of travel in the date-growing countries of the Orient and North Africa. It is the latter circumstance which gives the book its importance as a mine of information and practical hints.

It is written with remarkable freshness and directness, and interest is well sustained throughout the volume. After a brief discussion of the history of the date palm, the author deals with the countries in which the palm is grown, the commercial conditions of its cultivation and its cultivation in general, its propagation by offshoots and seeds and its pollination; then follow chapters on the handling of the crop and artificial ripening, on diseases and pests, the classification of dates, the profits of date growing and the uses of the date in and outside its home. A list of varieties, with descriptions of them, runs to over 90 pages, and yet it is merely a selection of the most important ones.

In America date cultivation is limited at present to certain parts of California and Arizona and to a small district in Texas, but there must be much land in Northern Mexico suitable for that purpose. It may be expected that the book will act as a very effective stimulus for the extension of date growing in America, as well as in other parts of the world and for improvement in the treatment of the palm and the selection of its varieties in its own home. O. S.

The Banana.†—This book fulfils a want that has grown with the remarkable development in the trade in a fruit so universally popular.

From the cutting of the bunch to the retailing of the hands and single fruits in our streets, the regulation of the times of cutting, carriage, storage, delivery and distribution is an elaborate system, requiring probably more skill than the growing of the plant itself. The two kinds chiefly grown are *Musa sapientum*, L., var. "Gros Michel," cultivated largely in Jamaica, Costa Rica and other

* Date-Growing in the Old and New Worlds, by Paul B. Popenoe, pp. 297 with 3 appendices and 40 plates. West India Gardens, publishers, Altadena, California. $2 00 net. 1913.

† "The Banana: Its Cultivation, Distribution and Commercial Uses," by William Fawcett, B.Sc., F.L.S., pp. i.-xi. 1-287, illustrated; Duckworth & Co., London, 1913; 7s. 6d. net.

parts of Central America, and *Musa Cavendishii*, Lam., the "Canary Banana."

In the present work descriptions of 66 species of *Musa* are given. In the sub-genus *Eumusa*, the two kinds above mentioned and the "Manila Hemp Banana" (*Musa textilis*, Nées) are the best known and most useful representatives.

There are 34 chapters dealing with general cultural details, fungous and insect pests; bananas as food and in medicine; drying, trade, transport; wine, whisky, alcohol and fibres from bananas; a general review of cultivation throughout the tropics; horticultural and botanical notes; banana allies; species of *Musa*, and an appendix giving recipes for cooking the fruits.

Seventeen illustrations are given, including two reproductions of "A Banana Plant," from Hughes, "History of Barbados" (1750), and Labat, "Nouveau Voyage aux Isles de l'Amerique" (1721), and several modern photographs. A few illustrations of the various kinds of suckers would have enhanced the value of chapters iii. and vi. on "Planting, Pruning and Treatment of Suckers," since "maiden suckers," "sword suckers," "followers," "ratoons" and "peepers" are mentioned. Most of chapter vi. is extracted from the Journal of the Jamaica Agricultural Society (xvi. 305, 1912), and the writer (H. Q. Levy) admits the difficulty of explaining on paper the details of the essential operation of pruning; he also states "there is no part of banana cultivation that needs as much individual attention, supervision and judgment as the pruning. The retaining of wrong suckers may mean the loss of hundreds of pounds to the large cultivator."

The chapter on Alcohol is particularly appropriate and of special value in view of the widely spread interest taken at the present time on its prospects as a substitute for petrol. The utilisation of the waste material, other than that fit only for use as manure, in such an industry is a problem of some force throughout the tropics and worthy of every consideration. It is calculated (p. 127) that in Jamaica alone over 3,000,000 bunches of bananas, value about £200,000 are produced annually, which cannot be profitably exported.

In the chapter on "Manila Hemp and other Fibres from species of Musa" reference is made to *Musa Ensete*, Gmel. of Abyssinia, grown for fibre in German East Africa; *Musa ulugurensis*, Warb. and Moritz, a new species from Uluguru, German East Africa—fibre regarded as a very useful material, value £40 per ton—and the "Wild Banana" (*Musa Livingstoniana*, Kirk) from Nairobi, British East Africa, all of which belong to the sub-genus *Physocaulis* or swollen-stemmed Musas.

When so much has been written on a subject like the present, reference to other works on the same or allied plants cannot be avoided, and the work under consideration is no exception in this respect, though every source that has been drawn upon is duly acknowledged. The book has evidently been prepared with great care and the author's many years of experience in Jamaica, referred to in the foreword by Sir Daniel Morris, is a sufficient guarantee of the value this book will be to planters and all interested in the botany, agriculture or commerce of the Banana.

J. H. H.

Handbook of Potato Diseases.*—The Department of Agriculture for Victoria has recently issued a work by Mr. D. McAlpine, Government Vegetable Pathologist, on the fungus diseases of the potato in Australia. The volume, though dealing only with diseases occurring in that continent, forms a useful contribution to the literature of the subject and will be appreciated in many countries outside Australia. There are some 100 pages of general text, 50 plates, and appendices dealing with animal pests, regulations as to potato diseases in the State of Victoria, and in the entire Commonwealth, together with data as to temperature and rainfall, factors intimately connected with the distribution of disease in a territory such as Australia. The general part is concerned with the following:—*Phytophthora infestans*, *Macrosporium Solani*, *Hypochnus Solani* (= *Rhizoctonia*), "Scab" (of which various types are distinguished), *Fusarium Solani*, *Bacillus Solanacearum*, and several other diseases of minor importance. By far the largest portion of the book is taken up with the "Irish Blight" (*Phytophthora*), a great deal of useful information being brought together, including the results of the author's own experiments and observations. The debated question of the part actually played by hibernating mycelium in the propagation of the fungus is discussed in detail. Evidence is brought forward showing the importance of this source of infection, and the author believes that in Australia it is very largely responsible for the continuation and spread of the disease.

The other maladies being less serious have not been the subject of so much enquiry, but "Scab" is treated at some length, and a few new observations are recorded. The subject of spraying and disinfection of "seed" also receives attention. It is worthy of note that two of the worst diseases in this country, namely, Wart Disease (*Synchytrium endobioticum*) and Corky Scab (*Spongospora scabies*) are not known in any part of Australia.

A. D. C.

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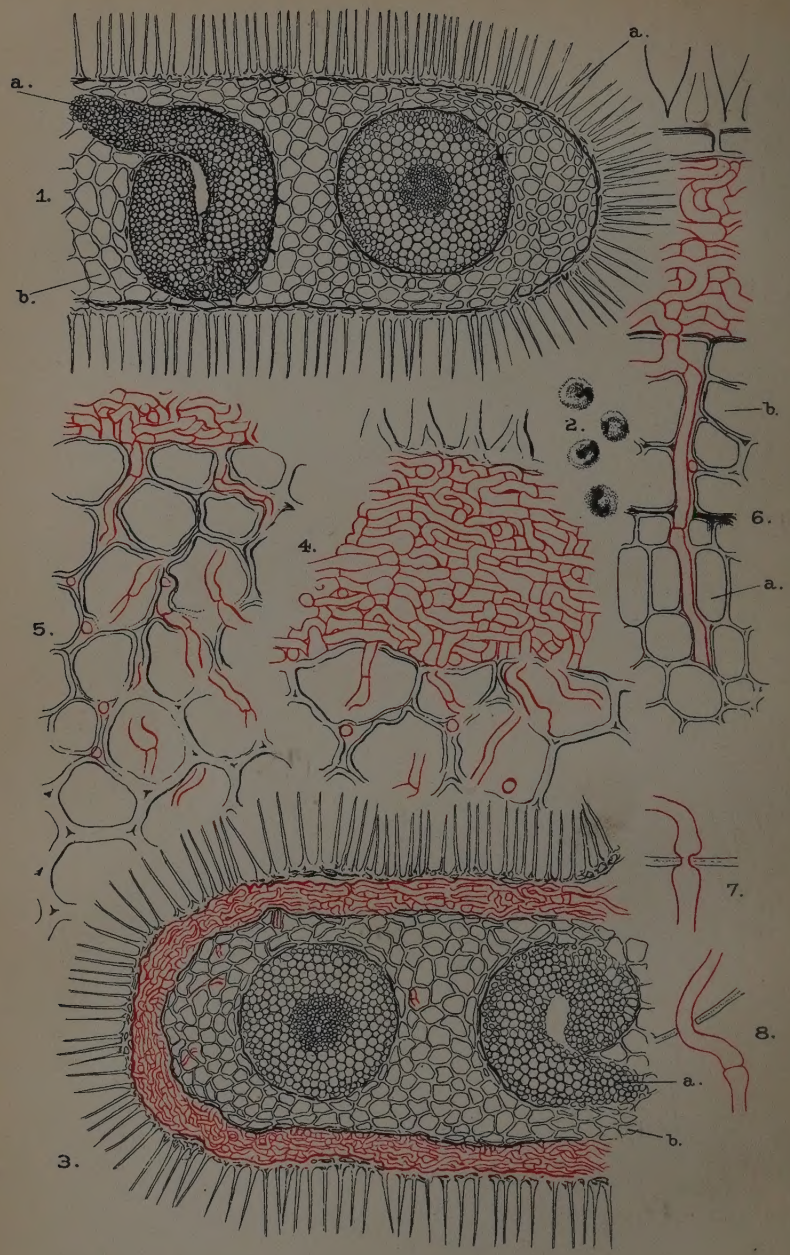
*Handbook of Fungus Diseases of the Potato in Australia and their Treatment, by D. McAlpine, pp. iii.+215, with 158 figures and a map. Department of Agriculture, Victoria.



Macrosporium solani in Tomato Seed.

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